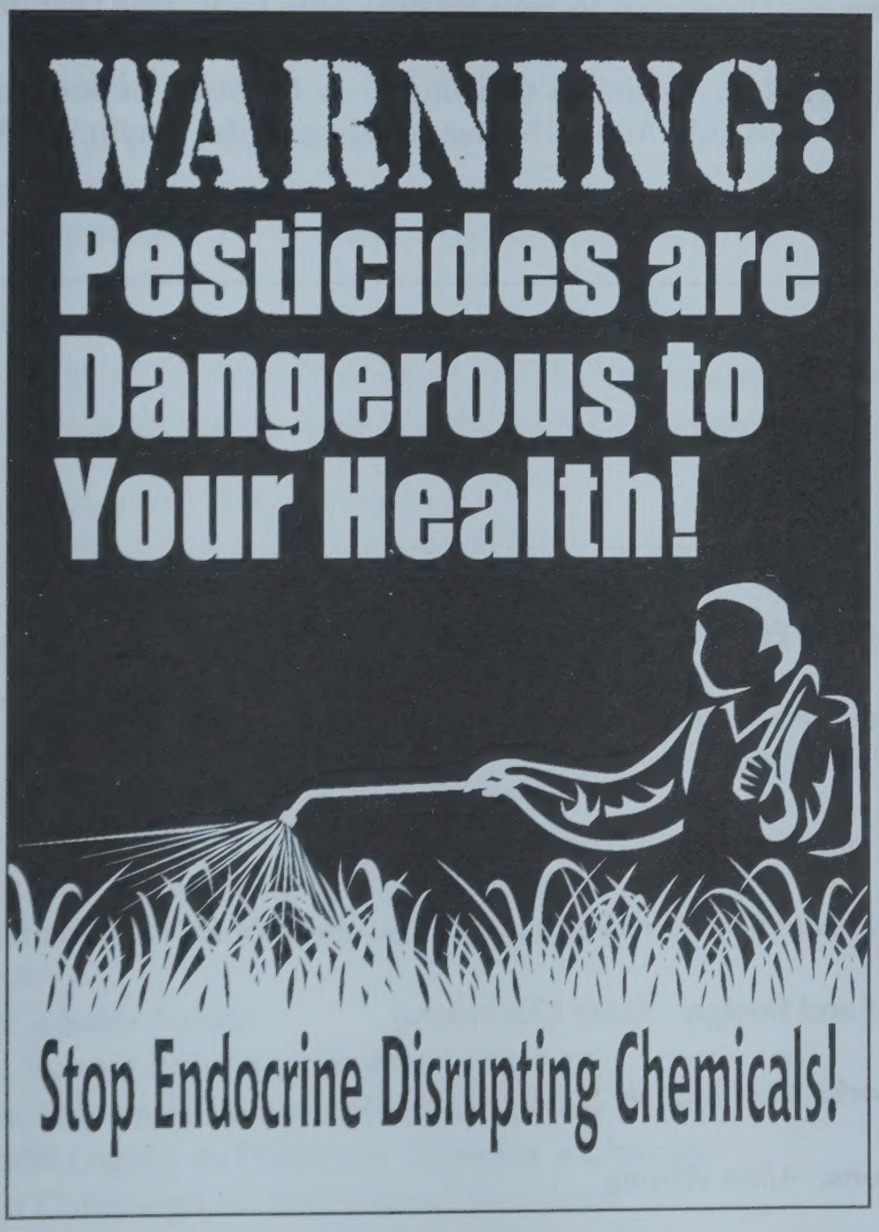
WARNING:

Pesticides are Dangerous to Your Health!

Stop Endocrine Disrupting Chemicals!

Pesticide Action Network (PAN) Asia and the Pacific



This Resource Book, and the accompanying poster, comprise the Information Kit for Pesticide Action Network and the Pacific's (PAN AP) Safe Food Campaign 1999. These materials have been specially produced in order to facilitate information sharing and exchange with our Asia Pacific network partners, the media, and the public at large. It is hoped that the Campaign, and the information shared, will stimulate discussions as well as encourage networking, involvement and participation in the campaign.

Perpustakaan Negara Malaysia Cataloguing-in-Publication Data

Warning: Pesticides are Dangerous to Your Health! Stop Endocrine Disrupting Chemicals
ISBN: 983-9381-22-9
1. Endocrine Toxicology. 2. Pesticides toxicology. I. Pesticide Action Network (PAN) Asia and the Pacific. II. Pesticide Action Network Asia and the Pacific's (PAN AP) Safe Food Campaign 1999.
615.902

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Printed by: *Jutaprint, Penang*

November 1999

Contents

"Unless the environmental load of synthetic hormone disruptors is abated and controlled, large scale dysfunction at the population level is possible. The scope and potential hazard to wildlife and humans are great because of the probability of repeated and/or constant exposure to numerous synthetic chemicals that are known to be endocrine disruptors...."

Theodora Colborn and others, 1990

Foreword

by Dr. Romeo F. Quijano, M.D.

Over the past few years, there has been growing worldwide concern on the adverse effects of many synthetic chemicals on the endocrine system of both animals and humans. Evidence is accumulating that certain chemicals, appropriately called "endocrine disruptors", interfere with the delicate functions of internal biological messengers called hormones that are essential to the growth, development, and survival of higher life forms, especially humans.

Lowered sperm count and reduced fertility, genital deformities and other congenital abnormalities, immune system dysfunction, altered foetal development, abnormal physical, mental and psychosocial development in infants and children, degenerative disorders, cancer and other health problems are increasingly being associated with exposure to a growing list of chemicals, most of which enter the body through the ingestion of food.

Many of these poisons, particularly pesticides, are used in the production, processing and storage of food. Thus, the safety of food, the basic requirement for the sustenance of life and for the long-term viability of future generations, is seriously being threatened. Indeed, the future is being "stolen".

But the problem is much more than the poisonous chemicals. We have to recognize that there are the poison-pushers, the transnational agro-chemical companies (TNC's) that aggressively promote and monopolize the basic elements of the food system such as seeds and agro-chemical inputs. Then there are the corrupt governments, especially those in the most powerful developed countries, who protect and advance corporate interests using coercive powers of authority to contravene their own people's mandate to protect people's interests. Together, these 'twin powers' force their way into disadvantaged communities through various agencies like the IMF, World Bank and the WTO. They impose a 'globalized' economy characterized by monopoly control, monocropping and the supremacy of trade and profit concerns—thereby destroying indigenous culture and food systems, creating absolute dependency and powerlessness.

With their combined power and enormous resources, these 'twin powers' dictate the market oriented production system; establish the manner of distribution favoring the rich, construct the knowledge (including science) and information systems that mould consumer beliefs and preferences; and enforce a system of governance that guarantees the attainment of corporate objectives.

It is therefore necessary, to always ensure that the campaign for a poison-free environment is integrated with the people's struggle for land, food security and other fundamental social, political and economic rights. Campaign strategies must truly be community-based , and must ultimately lead to peoples empowerment.

Freedom from poison cannot be achieved without social emancipation. It is likewise necessary for all concerned sectors to reach out in solidarity to grassroots activists, especially in the farming communities where food is primarily produced. NGO activists must have profound understanding of concrete realities at the grassroots level and have complete trust in people's ability to liberate themselves. Only a people's movement effectively striking at the core of the structural causes of the health and environmental assault by endocrine disruptors can bring "our stolen future" back.

Let this resource book be a weapon of this people's movement!

Dr. Romeo F. Quijano, M.D. is a toxicologist and health, pesticide and human rights activist, and presently Associate Professor at the Department of Pharmacology at the College of Medicine, University of the Philippines Manila. The President of the Pesticide Action Network Philippines, Dr. Quijano is also Consultant to the National Poison Control and Information Service of the Philippine General Hospital; Consultant to the Fertilizer and Pesticide Authority, Department of Agriculture of the Republic of the Philippines, and the Bureau of Fisheries and Aquatic Resources. He is Chairman of the Community Medicine Development Foundation and Foundation for Medicinal Plant Research and Development. He is Consultant to the Health Action Information Network, and Council for Health and Development (Consortium of Community-Based Health Programs). He is also Chairman of the Health Alliance for Democracy (A Health and Human Rights Organization) and Director of Political Relations in the National Executive Committee of the New Patriotic Alliance (Bayan), Philippines.

"There are several competing philosophies today that underwrite one or another form of agricultural practice. The educated, literate world largely recognises or knows only the modern method of farming involving the use of tractors, harvestors, chemical fertilizers and pesticides. This is also the dominant system since it is actually linked to a particular system of commerce. The driving philosophy behind the global extension of this form of agriculture is the objective of money profits. The state in every country supports this form of agriculture with an unimaginable quantity of subsidies. Despite the fact that such agriculture would not be able to survive without such subsidies, it is widely propagated as the more efficient form of growing food. Strange?"

Claude Alvares in "The Philosophy and Ethics of Organic Farming"

Introduction

by K. Prabhakar Nair and Jennifer Mourin

Modern agriculture has brought in the heavy use of chemical fertilizers and pesticides. With the more recent trends of globalization and trade liberalization, especially agricultural trade liberalization, the use of these chemicals in agriculture will be further intensified.

In many Asian countries trade liberalization of agriculture has lead to large-scale commercial farming and specialized export-crop farming, resulting in the massive use of pesticides to "boost production".

However, as one observer put it, there are no free lunches in modern agriculture. The kinds of chemicals used in these highly chemicalized agricultural systems have extracted a heavy price, particularly the pesticides. Besides killing people, pesticides have contaminated our water and food by way of pesticide residues, and have caused serious health problems. Some of these pesticides are so persistent that they move far and wide, remain in the environment for decades, and accumulate in fish, animals and humans, causing a range of ill effects. Reports of pesticide related deaths and diseases are now increasing all over the world. Most deaths from pesticide poisoning as also most other cases of serious poisoning, however, occur in the developing countries.

Consider these facts:

- around 200,000 people are killed worldwide every year from pesticide poisoning [1];
- pesticides can cause birth defects and impair brain function in children;
- evidence shows that exposures to pesticides can cause cancer, especially in children;
- reports from several countries show that, "children whose parents are occupationally exposed to pesticides or whose parents use pesticides in and around home are more likely to get leukemia, brain tumour," and some other types of cancers ***(See Article "Pesticides - Killers in Our Midst" in Section One)***;
- pesticides can also cause miscarriage and still births.

These are only some of the harmful effects reported.

A Poisoned Future?

Another class of adverse effects that has come to light recently is now causing increased concern about pesticides, and other chemicals. Several pesticides (as well as some widely used industrial chemicals) can disrupt the body's endocrine or the hormonal system—so crucial in growth and development. Known as *endocrine disruptors*, these chemicals can mimic or disrupt the normal functions of hormones, and tamper with this delicately balanced signaling system in the body that governs a range of functions and developmental processes.

Though their effects in human beings are being debated, the evidence is mounting. From wildlife and animal studies in laboratories, there is growing concern that these endocrine disruptors can cause developmental, reproductive, behavioural, immunological and physiological changes ***(See Article "Endocrine Disruptors: New Threats from Old Chemicals" in Section Two).***

In humans, for example, the incidence of certain types of genital birth defects and cancers have been reportedly increasing in industrialized countries, and these have been linked to endocrine disruptors.

Particularly worrisome is the threat that these endocrine disrupting chemicals pose on the unborn. When acting on a developing foetus at critical periods, they can cause lasting damage at such small doses—which were previously not thought to be harmful. "Endocrine disturbing chemicals raise profound questions about traditional science policy paradigms" [1], says Theo Colborn, a researcher and the author of the book, "Our Stolen Future", which documents the evidence for endocrine disruption. "Embryos and foetuses are especially sensitive at particular times to low doses of these chemicals, thereby calling into question the adequacy and relevance of high-dose testing on adult animals. Some chemicals have effects at low doses that differ from those at higher doses, undermining reliance on extrapolation from high doses."

Of Women and Children

The developing child in the womb, growing children and women are especially vulnerable to

pesticide problems. For women, both their physical make up and the social circumstances in which they live places them in particular vulnerability. Following the increasing corporatization of agriculture and the breakdown of the family farming system in Asia, more and more women are being pushed into carrying out much of the work on the farms, and as workers in the agricultural labour market. Women invariably end up doing the most back breaking and hazardous tasks, including handling pesticides—as sprayers and as mixers of pesticides—which exposes them to serious health risks.

But, given the patriarchal social structure prevalent in many countries, their health problems are "trivialized and rarely addressed"[2]. They are generally not told about the hazards of the pesticides they are handling, and when there are problems, there is a conditioned reluctance to talk about them; for, "their sub-ordinate positions in the community and the family...do not allow for an expression (of these problems) or an assertion of their rights."[2] There are, anyway, no basic rights such as medical help and, if there are, doctors may more often be unaware of the problems that pesticides can cause. There is also the threat of job loss, and the male-dominated unions have not been of much help, either.

Grassroots organizations in Asia working with farm labour need to address this problem. These groups need to create greater awareness of the problems among farm workers, as well as among wider sections of the public: including consumers who are being increasingly exposed to pesticides from residues in food (besides fruits and vegetables which are commonly contaminated, residues of neurotoxic pesticides have been found in children's foods in several surveys), bureaucrats and decision-makers, the media, etc.

And with their and their children's' health at stake, women farmworkers themselves must begin to play greater roles in farm workers' unions.

Policies and Actions for Change

With evidence of the health and ecological problems that pesticides (and other synthetic chemicals) cause accumulating from around the world, there is a need also for greater global action. Though some pesticides have been banned in many countries, they are still being traded, within the countries as well as across their borders; these need to be monitored and curbed. ***(See Article 'Policies for a Safer Future' in Section Four).***

One of the major initiatives that have taken place at the global level has been the negotiations on a legally binding instrument to phase out persistent organic pollutants (POPs). But in order to significantly reduce exposure to endocrine disrupting chemicals (EDCs), we need to focus on reducing exposure to endocrine disrupting pesticides and chemicals, and to stop their use. We need to look for safer non-chemical alternatives.

Governments need to review, evaluate and screen chemicals for both their acute and chronic toxicity, as well as for their reproductive and endocrine disruptive effects with bans and severe restrictions imposed on these chemicals.

Only a concerted effort for pesticide reduction, and a reduction on pesticide dependency, will provide long-term solutions. This, coupled with international bans on pesticides known to be hazardous to human health, may provide the best solutions to remove the source of these hazards.

The answer, ultimately, is to grow food without pesticides and to find ways to live without them. ***(See Article "A Pesticide Free World?" in Section Three).*** A large number of groups around the world are doing this successfully, using a set of practices known variously as sustainable agriculture, organic farming, biodynamic farming, etc. Governments, particularly European governments, are now increasingly supporting such efforts. Many governments have initiated policies to progressively reduce the use of pesticides in their agriculture. Others have adopted integrated pest management, which makes use of nature's ecological balance to control pests, instead of relying exclusively on pesticides, which kill not only the "pests" but also the "beneficial life-forms".

Profiting from Poisons

Meanwhile, the transnational pesticide companies are using opportunities afforded them via trade liberalization policies to push hazardous pesticides into developing countries, in the name of helping to "increase food production" and "feed the hungry millions". And there is an intense competition among the companies in doing so, marked by hectic acquisitions and mergers. Consequently, there is a tremendous concentration of resources, and today only a few transnational agrochemical companies dominate the market.

These companies are also now combining the seed trade with pesticides to gain greater control over the market. The companies are increasingly targeting rural women in Asia, who are unaware of the hazards, for the promotion of pesticides—offering a series of incentives and getting the farmers dependent on pesticides. Heavy advertisements, sponsoring of cultural and school programmes, micro credit schemes for buying new seeds, etc are only some of the new tactics being used by these companies in rural areas. And by projecting eco-friendly labels in promoting pesticides, they are also undermining or hijacking the

genuinely alternative movements of sustainable or organic agriculture.

Finally, in the noisy celebrations to mark the end of a century in the modern era (marked by the increasing use of hazardous chemicals) let us remember one of the worst chemical disasters in history which has taken a human toll of over 15,000 people—the poisonous gas leak at the Union Carbide factory in Bhopal, India. This factory produced methyl iso cyanate and hydrogen cyanide, which go into making pesticides. Fifteen years ago, on the night of December 2-3,1994, the methyl iso cyanate leaked from the factory and exposed over 500,000 people in Bhopal to the poisonous gas. Besides the deaths, at least a quarter of the people exposed still continue to suffer from a range of acute illnesses, including respiratory problems, neurological disorders, damage to the brain, eyes, the reproductive and the immune system, etc. And they have still not received adequate medical treatment or compensation. Who is responsible for this massive continued suffering?

On December 3, let us remember this tragedy, and what harm hazardous chemicals can cause...

The Safe Food Campaign

The Safe Food campaign for 1999 challenges the legacy of pesticides that has plagued and poisoned the human family and the environment, quite a number of which are endocrine disruptors—adding to the litany of acute and chronic ill-effects and problems pesticides already cause. The continued manufacture and use of endocrine disrupting chemicals, including pesticides commonly used in agriculture and food production, is a serious threat to the future and existence of the human family and biodiversity on the planet.

The Campaign will be launched on the global Pesticide Action Network "NO Pesticides Use Day" on December 3—held in poignant commemoration of the hundreds who died, and the thousands who suffered the disaster at Bhopal. The Day is being held to also draw attention to the life threatening impacts of chemical pesticides on people and the environment. PAN AP and other partners in the region will be organizing events to not only launch the campaign but to also introduce and draw peoples attention to the issue of endocrine disruptors.

For the last three years, PAN AP has collaborated with various partner groups in the region on the Safe Food Campaign. The Campaign is a public awareness and media campaign to promote sustainable agriculture and safe food. It is also a tool to facilitate unified and concerted yet varied action, via the different groups in the Asia Pacific region, on a chosen theme each year.

The Safe Food Campaign for 1999 upholds peoples' right to know about the effects of endocrine disrupters, and to demand precautionary measures towards a safer, more sustainable environment for present and future generations.

Farmers, workers and consumers have a right to be informed, and to have access to all the information on poisons that they are using, spraying, and possibly consuming. PAN AP upholds the right of people to make informed choices on what they maybe exposed to, and whether or not they are willing to risk being exposed to these chemicals. Most importantly, people subsequently have the right to decide that they do NOT want to have to use or be exposed to these products, and suffer from the ill effects of these poisons.

People also have a right to voice their dissent! The right to information, and in this context, the right to know the potential adverse effects of these products, is an indispensable element of the right to health. It is a non-derogable, basic human right. There can be no meaningful exercise of the right to health, without the concomitant exercise of the right to information. The right to information, therefore, cannot be subordinate to the 'right' to property and the 'right' to engage in business, or to 'intellectual property rights'.

The Campaign emphasizes local, safely produced foods through healthy and sustainable land use, and agriculture. PAN AP ultimately calls for the production of food free from pesticides, endocrine disrupting chemicals and genetic manipulation.

We support community-based food production that will protect the health, livelihoods and communities of rural, indigenous peoples, in agriculture - in particular women. We also support consumers, food producers and peoples' organizations in asserting their rights to take action in resisting the onslaught of endocrine disruptors.

Jennifer Mourin is Coordinator of the Safe Food Campaign.

K. Prabhakar Nair is an activist and journalist, and was formerly with the "Science Today" of the Times of India. One aspect of his current work includes consultant to PAN AP's Safe Food Campaign.

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1. Colborn T., "Building scientific consensus on endocrine disruptors", Environmental Toxicology and Chemistry, Vol. 17, No. 1, 1998.

2. Rengam S. V., "Harvesting Hope—Empowering Women in Pest Management, Pesticide Action Network Asia and the Pacific, 1998.

"Half a century ago, scientists made the unsettling discovery that man-made compounds, such as the pesticide DDT, accumulate in the bodies of people and wildlife. Today synthetic chemical contamination is pervasive and global. There is no clean, uncontaminated place and no person untouched by this chemical legacy..."

From "Chemicals that Compromise Life", World Wildlife Fund.

Section One

The Pesticide Problem

Pesticides - Killers in Our Midst

by Dr. Marion Moses

Introduction

Pesticides are toxic chemicals delib erately added to our environment. They are poisons by design whose purpose is to kill or harm living things. They can kill or harm human beings as well.

Many of the pesticides being used in farms, orchards, plantations and rural rice fields around the world are highly toxic. Farmers and agricultural workers are heavily exposed to pesticides known to damage the brain and nervous system or that cause cancers, birth defects, miscarriages and stillbirths. Many of the pesticides they are exposed to are banned or severely restricted in other countries. ***(See Box: Banned Pesticides are Still Traded).***

A farmer in North Sumatra, Indonesia, spraying while walking through pesticide sprayed fields, with no protective clothing. Photo: PAN North Sumatra.

In rural Asia for example, the use of pesticides has permeated even the remotest village. The availability of highly toxic pesticides, lack of information and knowledge of their hazards, aggressive marketing by the industry as well as poverty, illiteracy, and lack of health facilities ensure that pesticides are a major cause of poisoning in rural farming communities. Impacts on the health of women and children are of a particular concern.

The severity and extent of the problems described by women working in rural farms and plantations in Asia are shocking. Pesticide exposure is a likely source of many of the health problems documented by groups like PAN Asia and the Pacific. Unlike other parts of the world, women in Asia have more direct and heavier exposure to pesticides than their sisters in other regions.

The majority of workers who apply pesticides in plantations, in countries like Malaysia for example, are women. They also mix pesticides and pour them into the spray containers which is an even more serious health risk since they are handling the concentrated products. Often, the women do not even know the names or hazards of the pesticides they are mixing and applying. They receive no education or training in how to use them properly or how to protect themselves and their children. Even if they were provided full protective equipment and clothing appropriate for pesticides they are working with, they would still be at risk from heat stress and even death from heat stroke. This is especially true since they do not have enough water (or sometimes not any water) to drink

Banned Pesticides are Still Traded

Though several highly hazardous pesticides are banned in many countries, they are still being produced and exported, and finding their way to many other countries. Many of these are amongst the "dirty dozen" pesticides—in reality 18 pesticides including chlordane, parathion and lindane that were the subject of a decade long campaign by the Pesticide Action Network.

During 1995 and 1996 for example, the U.S. exported highly toxic pesticides including chlordane, heptachlor, parathion and lindane, to countries which had banned them. Chlordane was exported to Brazil, Singapore and the Netherlands; heptachlor to Brazil and the Netherlands; aldicarb (an "extremely hazardous" pesticide) to Argentina and paraquat (another highly toxic pesticide) to the Dominican Republic. Other hazardous chemicals exported include pentachlorophenol to Thailand and EDB to Belgium.

According to Greenpeace, India, which has emerged as a major centre of pesticide production in Asia (the other being China) exports hazardous pesticides including aldrin, chlordane, heptachlor, DDT and BHC to several countries, "including countries where their use has long since been banned".

"Reports indicate that clandestine manufacturing of several POP (persistent organic pollutant) pesticides may be contributing to illegal exports to Bangladesh and Nepal. As far as many Bangladeshi and Nepali activists are concerned, India is to South Asia what the U.S is to the world—a "toxic imperialist".

For instance, during 1997 India exported DDT to Bangladesh, Japan, Nepal, New Zealand, Sri Lanka, Switzerland and United Arab Emirates, and aldrin to 20 other countries including Australia, the Netherlands and the U.S. "However, officials from the Netherlands and Australia report that their records do not reflect these findings."

Despite aldrin's registration being withdrawn in 1996, Greenpeace's research found that aldrin formulations were being sold in shops in New Delhi. A shopkeeper said several manufacturers continued to supply aldrin as "this is the best for killing termites..., it is poisonous only if you drink it".

Source: "Toxic Legacies; Poisoned Futures –Persistent Organic Pollutants in Asia", by Von Hernandez and Nityanand Jayaraman, Greenpeace International, Amsterdam, 1998; and Global Pesticide Campaigner, Volume 9, Number 1, PAN North America, April 1999.

in order to flush out these toxins. Many women are working with pesticides that are so dangerous they cannot be used safely under any conditions of agricultural practice. Even those who do not spray are exposed to pesticides through agricultural activities involving contact with heavily sprayed crops.

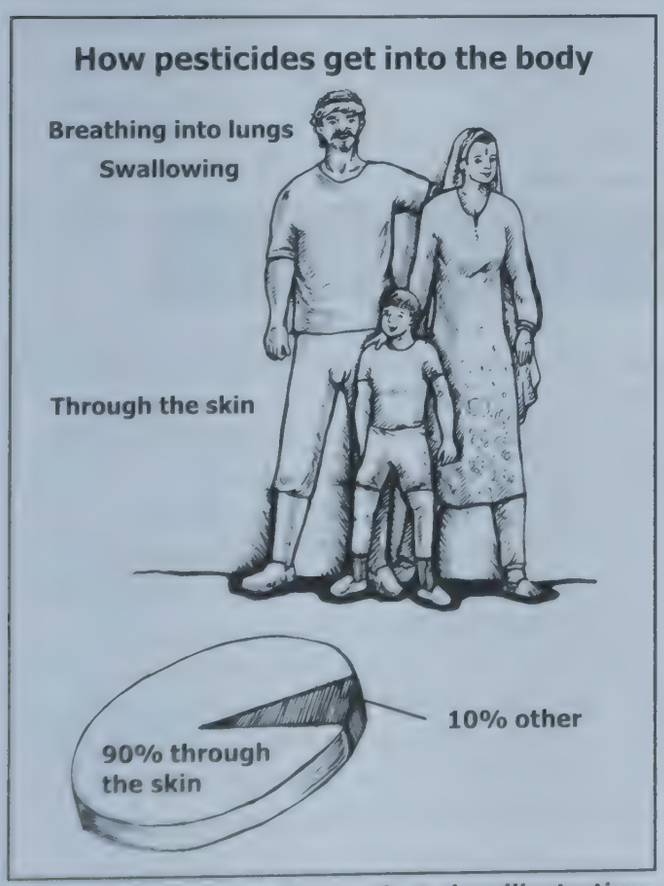


Illustration by Allan Woong, based on illustrations in 'Harvest of Sorrow- Farm Workers and Pesticides', Part I, by Dr. Marion Moses.

The purpose of this article is to briefly summarize the human health effects of pesticides. The discussion is in two parts:

1. The three major factors contributing to the impact of pesticides on human beings.

2. The three major ways that pesticides affect human health.

A special effort has been made to highlight particular concerns women and children face from exposure.

Factors Contributing to the Impact of Pesticides on Human Beings

There are three major factors in the impact of pesticides on human beings - how hazardous or poisonous they are, how they get into the body, and how long they stay there.

1. How Hazardous or Poisonous a Pesticide Is

The U.S. Environmental Protection Agency (EPA) and the World Health Organization (WHO) classify each pesticide into one of four categories; depending on how much it takes for the pesticide to kill a laboratory rat or mouse. The less it takes to kill the animal the more toxic it is. The most dangerous pesticides are in EPA Category I, and WHO Category IA and IB. These categories do

Table 1
Highly Toxic Pesticides
EPA Category I - WHO Category IA and IB
LD_{50} or MLD[1] (in milligrams/kilogram of body weight in rats)

Pesticide (brand name)	Use[2]	LD_{50} MLD[1]	Pesticide (brand name)	Use[2]	LD_{50} MLD[1]
Acrolein (Magnacide H)	H	29	Isofenphos (Oftanol)	I	20
Aldicarb (Temik)	I	1	Isolane	I	11
Azinphos-ethyl (Gusathion A,)	I	12	Mephosfolan (Cytrolane)	I	8.9
Azinphos-methyl (Guthion, Gusathion)	I	4	Mecarbam (Afos)	I	36
Bomyl	I	31	MEMA (Organic Mercury Compound)	Fn	25
Calcium cyanide	Fm	10	MEMC (Organic Mercury Compound)	Fn	22
Carbofuran (Furadan)	I	15-26	Methamidophos (Monitor, Tamaron)	I	20
Chloethocarb (Lance)	I	35.4	Methidathion (Supracide)	I	44
Chlormephos (Dotan)	I	7	Methiocarb (Mesurol)	I	20
Cycloheximide	Fn/PGR	2	Methomyl (Lannate, Nudrin)	I	17
Demeton (Systox)	I	2.5-6	Methyl parathion (Folidol-M)	I	20
Demeton methyl (Metasystox)	I	30	Mevinphos (Phosdrin)	I	3
Dieldrin	I	37	Mexacarabate (Zectran)	I	24
Dimefox (Hanane)	I	5	Monocrotophos (Azodrin, Nuvacron)	I	8-23
Dinitro-ortho-cresol (DNOC)	Fn/H/I	20	Omethoate (Folimat)	I	25
Dintirophenol (DNP)	I/Fn	30	Oxamyl (Vydate)	I	5.4
Dinoseb (DNBP)	H	40	Oxydemeton methyl (Metasystox-R)	I	30
Dioxathion (Delnav)	I	45	Oxydifulfuton (DiSyston S)	I	3.5
Disulfuton (DiSyston)	I	4	Parathion (Ethyl parathion, Folidol)	I	2
Endrin	I	7-15	Phorate (Thimet)	I	2-4
Ethion	I	21	Prothoate	I	8
Fenamiphos (Nemacur)	N	5	Schradan	I	9
Fensulfothion (Danasit)	I	5	Sodium arsenite (Pamol)	Fn/H/I	10
Fluenethyl (Lambrol)	I	3-8	Sodium cyanide	Fm	6.4
Fonofos (Dyfonate)	I	8-17	Sulfotepp (Bladafume)	I	10
Formetanate HCl (Carzol)	I	20	Terbuphos (Counter)	I	1.3
Fumitoxin (Phostoxin)	Fm	0.3	Thallium sulfate	R	16
Isazofos (Triumph)	I	40	Zinc phosphide	Fm	45.7

1. Lethal Dose 50. Median Lethal Dose - the lower this number the more toxic the pesticide.
2. I = insecticide, Fm = fumigant, Fn = fungicide, H = herbicide, N = nematicide, R = rodenticide. PGR = plant growth regulator.
Compiled by Dr. Marion Moses, Pesticide Education Center, San Francisco CA., 1999.

not include long term effects. ***(See Table 1 for a list of the most dangerous pesticides).***

2. How Pesticides Get Into the Body

There are four ways that pesticides get into the body - by breathing them in, by swallowing them, through the skin and through the eyes in cases of splashes or spills. Most workers think that breathing in the vapors is the major way that pesticides get into the body. This is not so. The major route of pesticide absorption into the body is through the skin. Some parts of the skin however absorb pesticides more easily than others. The genital area is an area of high absorption, as is the face and neck, followed by the back of the hand, and the armpits and lower forearm. If the skin is damp or wet, or if there is a cut or rash or even minor irritation of the skin, pesticides will go through the skin faster and in larger amounts.

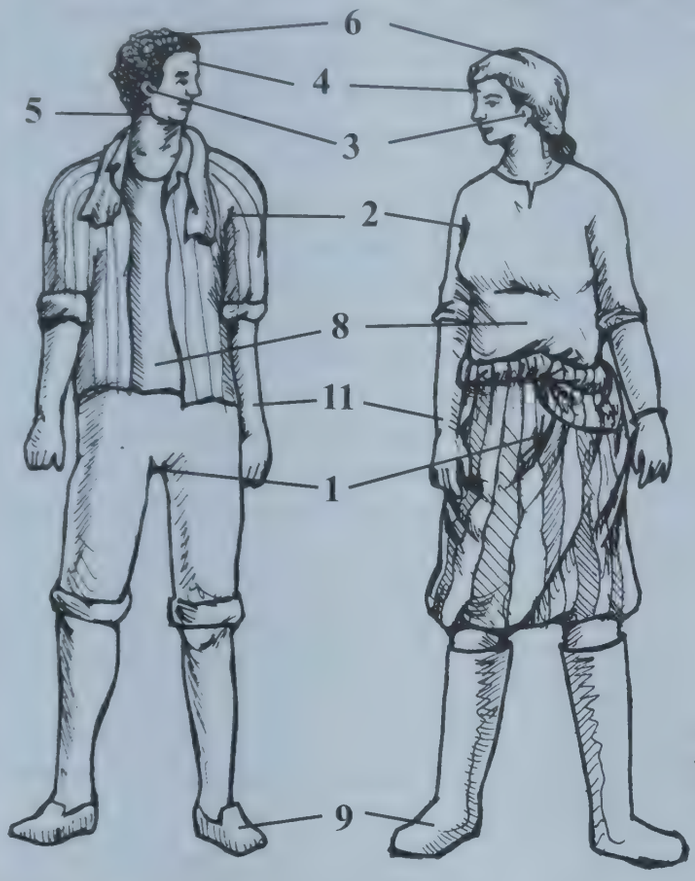
Children will absorb more pesticides than an adult at the same level of exposure. This is because they have a lot more skin surface for their size than adults, and also take in more breaths per minute. ***(See Box: Infants and Children Face Greater Risks! on page 14).***

Women have thinner skin than men and may likewise absorb more under similar levels of exposure. If a woman is pregnant, once pesticides get into the blood stream they can cross the placenta and affect the developing foetus.

3. How Long Pesticides Stay in the Body

A lot of the older pesticides such as DDT, dieldrin, lindane, heptachlor, and chlordane break

Absorption of Pesticides Through the Skin



Order of absorption highest to lowest:

1. Scrotum
2. Armpit
3. Ear canal
4. Forehead
5. Behind ear and jaw
6. Scalp
7. Top of hand
8. Abdomen
9. Ball of foot
10. Palm of hand
11. Forearm

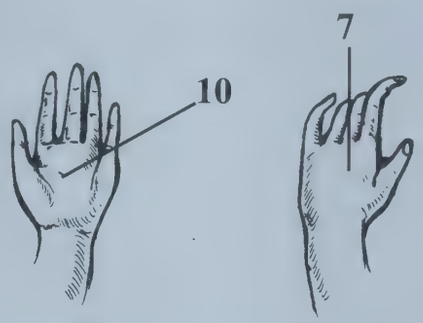


Illustration by Allan Woong, based on illustrations in 'Harvest of Sorrow- Farm Workers and Pesticides', Part II, by Dr. Marion Moses.

down very slowly. Children do not handle toxic chemicals in their bodies as well as adults. This is because their liver enzymes and their immune systems are less mature. Women also may have less efficient detoxifying mechanisms, especially during pregnancy and lactation.

The DDT type of pesticides are also known as persistent organic pollutants, meaning that they are persistent in the environment and resist breakdown by natural processes for long periods of time. Because they are fat-soluble and resist breakdown, these chemicals are stored in fatty tissues and can stay in the body for many years. Since women have a higher percentage of body fat than men, they store more pesticides in their body. Human breast milk is also high in fat and pesticides have been found in human milk in several countries.

Most of the pesticides in use today do not stay in the body for more than two or three days. They are eliminated from the body through the urine. This is why it is very important for workers exposed to pesticides to drink lots of water. Women especially must drink lots of water since their renal function compared to men, is slightly less efficient, especially during pregnancy.

The Major Ways Pesticides Affect Human Health

Pesticides affect human health in three major ways – causing immediate health effects, causing long term effects, and worsening pre-existing conditions.

1. Immediate Effects

Reactions to pesticides that occur within a very short time after exposure are called acute effects. They can appear within minutes or hours, sometimes days of exposure. The most common acute effects are irritation of the eyes, nose and throat, such as tearing, stinging, burning and coughs. Skin rashes and itching are also common. Nose bleeds are less common. These local effects are due to direct contact with the pesticide.

Some pesticides can cause allergic dermatitis. Plants such as poison oak, poison ivy and many others that workers are exposed to can also cause allergic dermatitis. It may be difficult to find out whether it is a pesticide or not without doing special skin tests. Pesticides reported to cause allergic dermatitis include anilizine, benomyl, captan, chlorothalonil, dazomet, dichlorvos, malathion, maneb, naled, and PCNB.

After pesticides go through the skin they get into the blood stream and go throughout the body.

Table 2
Pesticide Chemicals Classified by US EPA as Known, Probable or Possible Human Carcinogens

Group A - Known Human Carcinogens

Arsenic, inorganic
Chromium VI
Ethylene Oxide Group I

Group B1 - Probable Human Carcinogens
(with limited human evidence)

Acrylonitrile
Cadmium
Creosote
Ethylene Oxide
Formaldehyde

Group B2 - Probable Human Carcinogens*
(with sufficient evidence in animals and inadequate or no evidence in humans)

Acetochlor
Aciflurofen, sodium salt
Amitrole
Cacodylic Acid
Captafol
Captan
Chlordimeform
Chloroaniline
Cyproconazole
Daminozide (Alar)
1,2-Dichloropropene (Telone)
1,1-Dimethyl hydrazine (UDMH)
Dipropyl isocinchomeronate (MGK 326)
Fenoxycarb
Folpet
Furmecyclox
Haloxyfop-methyl
Lactofen
Mancozeb
Maneb
Metam Sodium
Orthophenylphenol
Oxythioquinox
Procymidone
Pronamide
Propargite
Propoxur (Baygon)
Propylene Oxide
Terrazole
Thiodicarb
Triphenyltin hydroxide

Group B2 - Probable Human Carcinogens**
(with sufficient evidence in animals and inadequate or no evidence in humans)

Acetaldehyde
Aramite
Azobenzene
Bis(chloroethyl) ether
Carbon Tetrachloride
Chlordane
Chloroform
1,2-Dibromo-3-chloropropane (DBCP)
Dibromoethane, 1,2 (EDB) -ethylene dibromide]
Dichloro diphenyl trichloroethane (DDT)
1,2 - Dichloroethane
Dicloromethane
Dieldrin
Di(2-ethylhexyl)phthalate
Epichlorohydrin
Ethylene thiourea
Heptachlor
Heptachlor epoxide
Hexachlorobenzene
Hexachlorocyclohexane, tech.
Lindane
Methylene chloride (see dichloromethane)
Mirex
Pentachlorophenol
Perchloroethylene
Polychlorinated biphenyls (contaminants
Propiolactone
Toxaphene
Trichloroethylene
Trichlorophenol 2,4,6

Group C - Possible Human Carcinogens

Amitraz
Asulam
Atrazine
Benomyl
Bifenthrin
Bromacil
Bromoxynil
Calcium Cyanamide
Carbaryl
Clofentezine
Cyanazine
Cypermethrin
Dacthal
Dichlobenil
Dichlorvos (DDVP)
Diclofop-methyl
Dicofol
Difenoconazole
Dimethenamid (SAN 682H)
Dimethipin (Harvade)
Dimethoate
Dinoseb
Ethalfluralin
Ethofenprox
Fenbuconazole
Fipronil
Fluometuron
Fomesafen
Hexaconazole
Hexythiazox (Savey)
Hydramethylnon (Amdro)
Hydrogen cyanamide
Imazalil
Isoxaben
Linuron
2-Mercapto benzothiazole
Methidathion
Methyl 2-benzimidazole carbamate (MBC)
Metolachlor
MolinateNitrofen
Norflurazon
N-Octyl bicycloheptene dicarboximide (MGK-264)
Oryzalin
Oxadiazon
Oxadixyl
Oxyfluorfen
Paradichlorobenzene
Parathion
Pendimethalin
Pentachloronitrobenzene
Permethrin
Phosmet
Phosphamidon
Piperonyl butoxide
Prochloraz
Prodiamine
Propazine
Propiconazole
4-Pyridazine carboxylic acid, 2-(4-chlorophenyl)-3-ethyl-2,5-dihydro-5-oxo-,potassium salt (MON 21200)-post FQPA
Pyrithiobac-sodium
Simazine
Tebuconazole
Terbutryn
2-(Thiocyanomethylthio) benzothiazole (TCMB)
Triadimefon
Triadimenol
Triallate
Tribenuron methyl
Tridiphane
Trifluralin
Triflusulfuron-methyl
Uniconazole
Vinclozolin

* Classified by the Office of Pesticide Programs ** Not Classified by the Office of Pesticide Programs
Source: U.S. Environmental Protection Agency. Pesticidal Chemicals Classified as Known, Probable or Possible Human Carcinogens. Office of Pesticide Programs. Washington, D.C. 1998.
Compiled by Dr. Marion Moses, Pesticide Education Center, San Francisco CA., 1999.

Once pesticides get into the system they can cause poisoning. Signs and symptoms of systemic poisoning include headaches, dizziness, nausea, vomiting, cramping, breathing difficulties and blurred vision. If the poisoning is severe and proper treatment is not available, death can occur. Most serious poisonings and deaths from pesticides occur in developing countries.

2. Delayed Effects

Pesticides can cause delayed or long-term effects which occur months or years after exposure. These are called chronic effects. They can result from low levels of exposure over a long period of time. They can occur even if there has never been any apparent health problems during the time of exposure to pesticides. The three major chronic effects from pesticides are cancer, neurological damage and adverse effects on the reproductive system.

CANCER: Many pesticides are known or suspected to cause cancer in laboratory animals. The U.S. EPA classifies pesticides into groups of known, probable, or possible causes of cancer in humans. (Table 2 lists the pesticides in these different categories).

There is now a large body of evidence that pesticide exposure is a risk factor for cancer in humans, especially children. Studies done in the United States, several European countries, Brazil, and China show that children whose parents are occupationally exposed to pesticides or whose parents use pesticides in and around the home are more likely to get leukemia, brain cancer, non-Hodgkin lymphoma, soft tissue sarcoma, and Wilm's tumour. There are many studies done throughout the world on farmers, pesticide sprayers and factory workers exposed to pesticides that link cancer in adults to pesticide exposures. The kinds of cancer that have been found include: non-Hodgkin lymphoma, brain cancer, leukemia, soft tissue sarcoma, pancreatic, testicular and prostate cancer among others.

NEUROLOGICAL EFFECTS: There is abundant evidence from laboratory animals that pesticides can cause permanent damage to the brain and nervous system. Low levels of exposure to neu-

rotoxic pesticides to the developing brain can potentially affect brain development in complex and subtle ways that are difficult to observe and measure.

Such potential effects include effects on memory, judgement and intelligence as well as personality, moods and behaviour. There are human studies that show permanent effects on the brain and nervous system years after apparent complete recovery from pesticide poisoning. There are many individual reports of permanent changes in behavior and personality in workers and others seriously poisoned by pesticides.

There are very few studies of highly susceptible groups such as pregnant women and children. Recent data show that endocrine disruptor pesticides can affect hormone levels at critical periods of development of the brain at very low levels of exposure that were previously thought to be not harmful. (See Table 3 for a list of pesticides which are endocrine disruptors).

Pesticide exposure can increase the risk of Parkinson's disease, especially in younger people. Pesticides may also be implicated in amyotrophic lateral sclerosis (ALS, Lou Gehrig's Disease) and other neurological diseases. The percentage of people poisoned by pesticides who develop changes in brain

Table 3
Pesticides that are Endocrine Disruptors

Alachlor	Fenchlorfos
Aldicarb	Fenitrothion
Aldrin	Fenvalerate
Amitrole	Fipronil
Atrazine	Flucythrinate
Benomyl	Heptachlor
Bifenthrin	Hexachlorobenzene
Bromoxynil	Hexachlorocyclohexane oxynil
Cadmium	Lindane
Carbaryl	Malathion
Carbofuran	Mancozeb
Chlordane	Maneb
Chlordecone (Kepone)	Mercury
Chlorpyrifos	Methomyl
lambda-Cyhalothrin	Methoxychlor
Cypermethrin	Methyl parathion
2,4-D	Metiram
DBCP	Mirex
DDE	Nabam
DDT	Nitrophen (TOK)
Deltamethrin	Ortho-phenyphenol
Dichlorvos (DDVP)	Parathion
Dicofol	Pentachlorobenzene
Dieldrin	Permethrin
Dienochlor	Picloram
Dimethoate	Pyrethrins
Dinitrophenol	Simazine
Dinoseb	2,4,5-T
Endosulfan (thiodan)	Toxaphene
Endrin	Tributyltin
Esfenvalerate	Trifluralin
Ethafluralin	Triphenyltin
	Vinclozolin
	Zineb

Source: Based on data found in U.S. EPA (Environmental Protection Agency) Fact Sheets, RED (Registration Eligibility Documents), and CalEPA (California Environmental Protection Agency) Toxicology Summaries of selected pesticides.
Compiled by Dr. Marion Moses, Pesticide Education Center, San Francisco CA., 1999.

DBCP and the Banana Workers

In 1997, four chemical corporations that produced dibromochloropropane or DBCP—Amvac, Dow, Occidental and Shell—reached an out-of-court settlement of over US$45 million dollars with thousands of banana workers from 11 countries. More than 6,000 of the claimants were Philippine farmers who worked in the banana plantations in Mindanao. The rest of the claimants came from Costa Rica, Honduras, Guatemala, El Salvador, Nicaragua and Ivory Coast.

The workers' lawsuits had demanded compensation for permanent sterility linked to DBCP exposure while they were working on the banana plantations. DBCP, an extremely toxic nematicide with severe acute and chronic health effects, is one of the 'Dirty Dozen' targeted by the Pesticide Action Network (PAN) for elimination. The first known human sterility cases linked to DBCP were identified in California in 1977. The companies knew that the product caused male sterility in rats as early as in the 1960's, but concealed this information. U.S. exports of DBCP never the less continued after the California cases came to light; after the fumigant was banned in the U.S. in 1979.

In the Philippines, DBCP was used in the 1970s and 80s. Tests conducted showed that the farmers were not adequately warned, or were not warned at all of the harmful effects of DBCP. Aside from sterility, the affected farmers also complained of impotence and cancers.

According to lawyers representing the banana workers made sterile by DBCP use in the 1970s and 80s, the vast majority of the 26,000 claimants had accepted the deal with the chemical companies. However, organizations representing male victims state that no amount of money could compensate for the suffering caused by the indiscriminate use of DBCP on banana plantations for 15 years. Not surprisingly, some had not welcomed the offer. The payments the individual workers would receive after deducting costs would be minimal. Although legal action is still continuing against banana multinational companies such as Chiquita, Dole, Del Monte and Standard Fruit, there are fears that these companies will also settle out of court for lesser amounts.

Source: Global Pesticide Campaigner, Vol. 8 No. 1, March 1998; and Philippine Daily Inquirer, June 25, 1997.

Infants and Children Face Greater Risks!

Infants and children face greater risk from pesticides and other environmental toxins because they have greater exposure, and less ability to get rid of toxic chemicals from their bodies.

Greater Exposure: Infants and children absorb more into their bodies than adults. The major reasons for this are:

1). They have much more skin surface for their size.
2). They take in more breaths per minute.
3). They eat and drink much more for their weight.
4). They are much more likely to come in contract with contaminated surfaces and objects.

The "job" of children is to explore. Their crawling, toddling, play and other activities put them in direct contact with contaminated soil, floors, furniture, toys, and carpets. They put everything in their mouths. They often wear less clothing therefore have more exposed skin surface. Children living on farms or near agricultural areas risk even greater exposures from drift and contamination of air, soil, food, and water by chemical pesticides.

Less Ability to Get Rid of Chemicals: Once pesticides get into the bodies of Infants and children, they are more vulnerable to toxic effects. The major reasons for this are:

1). Infants and children have less mature mechanisms in their body to break down chemicals into less harmful substances.
2). Infants and children have less mature mechanisms in their bodies to get rid of toxic chemicals from their bodies.
3). Infants and children have less mature immune systems to protect them from toxic chemicals.
4). Infants and children are growing and developing and at a rapid rate putting many body cells and tissues at risk – especially the brain and nervous system, and the blood and immune system.

This puts children at greater risk of cancer and other chronic diseases.

Brain Cancer: Studies done in the United States, Canada, France and Norway show that children whose parents are farmers or who live on farms have a three to seven fold increased risk for brain cancer. Two United States studies found that pesticide use in the home increased the risk of brain cancer in children six to eleven fold.

Leukemia: Studies done in the United States, Canada, and China show that children whose parents work with pesticides on farms have a two to eleven fold increased risk for leukemia. Studies done in the United States and German found that pesticide use in the home increased the risk of leukemia in three to nine-fold. Other studies also found children to be at increased risk for non-Hodgkin lymphoma, Wilm's tumor, and soft tissue sarcoma.

Source: Dr. Marion Moses, Cancer in Children and Exposure to Pesticides, Summary of Selected Studies, Pesticide Education Center, San Francisco CA. May 5, 1999.

function is however not known.

REPRODUCTIVE EFFECTS: Many widely used pesticides are known to cause birth defects, sterility and foetal death in laboratory animals (see Table 4). Occupational exposure to the pesticide DBCP (dibromochloropropane) is a proven cause of sterility in human males. ***(See Box: DBCP and the Banana Workers).***

Human studies have found increases in spontaneous abortion, stillbirth, infertility, and birth defects in exposed workers. The highest risk is in women who work and live on farms or in agricultural areas or who have come into direct contact with pesticides during pregnancy.

Studies often do not find an increase in birth defects associated with pesticide exposure. This may be due to direct toxicity to the embryo and foetus while still in the womb, leading to an early spontaneous abortion.

3. Effects on Existing Conditions

People with asthma and allergies, especially children can react to low levels of pesticides that do not affect those without them. The pesticides most likely to percipitate or aggravate asthma are the pyrethrins and pyrethroid classes of pesticides, and the organophosphates and methyl carbamates. However, any pesticide or inert ingredient can still be a potential problem. The only effective treatment is to avoid exposure to the pesticide.

Pesticides can also cause irregular heart rhythms, and people with heart disease may have a worsening of their condition when exposed.

Pesticide exposure can also weaken the immune system. The most susceptible to such effects are children, pregnant women, those with chronic medical illnesses, and cancer survivors.

Countering the Toxic Legacy

Pesticides are used in ways that maximize opportunities for human exposure and environmental contamination. Most regulations are not strong enough to protect workers from the adverse health effects of pesticides, especially women and children. Many workers are poisoned even when all rules and regulations have been followed.

Just because a pesticide is used according to label directions, it does not mean that potential harmful effects are not occurring. The effects may not show up until many years later. There is often a false sense of security if there is no apparent immediate illness or acute effects.

One of the most important concerns not addressed by current pesticide laws and regulations is the effect of multiple exposure. All workers are exposed to many different pesticides in the course of their working life. The combination of low level exposures to many different pesticides add up to a large toxic burden, especially for the embryo and foetus developing inside the womb. The possible synergistic effects of these combined and mixed exposures have not been studied. The laws that regulate pesticides do not require these kinds of tests to be done. The younger the individual the greater the risk of adverse effects from toxic exposures.

Some pesticides are so toxic that they cannot be used safely under any conditions of agricultural practice. Once we release these toxic chemicals we cannot take them back. The only way to eliminate the health risks from toxic pesticides is to eliminate the exposures; beginning with the most highly toxic pesticides and those that cause cancers and birth defects.

Future generations will no doubt look back on the twentieth century use of toxic pesticides in food production as one of the more bizarre practices of their ancestors. The public health community must work together with workers and their advocates to promote safer alternatives to toxic pesticides that do not threaten the health of people and the environment.

Table 4
Pesticides That Are Teratogenic (cause Structural Birth Defects) in Laboratory Animals

Acrolein	Fenarimol
Abarmectin	Fenoxaprop ethyl
Bacquacil	Fluazifop-butyl
Bitertanol	Folpet
Benazolin-ethyl	Hexachlorobenzene
Benomyl	Kinoprene
Bentazon	Maleic hydrazide
Bromoxynil	Mancozeb
Cacodylic acid	Methyl parathion
Captafol	Methoprene
Captan	Mirex
Carbaryl (Sevin)	Fenamiphos (Nemacur)
Chloramben	Nitrofen (TOK)
Chlordimeform	Ortho-phenylphenol
Chlorpropham	Paclobutrazol
Copper sulfate	PCNB
Cyanazine	Phosmet
Cycloheximide	Picloram
Cyromazine	Propargite (Omite)
2,4-D	Sodium arsenate
Dichlobenil	Sodium arsenite
Dichlorophene	Sodium omadine
DMF	2,4,5-T
2,4-DP (Dichlorprop)	Terrazole
Dinocap (Karathane)	Triadimefon
Dinoseb	Tributyltin oxide
Diquat	Trichlorfon
Endosulfan	Trifluralin
Endothall	Triphenyltin fluoride
Ethion	Triphenyltin acetate
2-Ethyl 1,3-hexanediol	Triphenyltin hydroxide
Ethylene dichloride	Vinyzene
	Warfarin

Sources: U.S. Environmental Protection Agency. Teratogenic Pesticides (as of June 1988), Office of Pesticide Programs, Washington, D.C. 1998. California Environmental Protection Agency, 'Chemicals Known to the State to Cause Reproductive Toxicity', Office of Environmental Health Hazard Assessment, Sacramento, CA. December 26, 1997.
Compiled by Dr. Marion Moses, Pesticide Education Center, San Francisco CA., 1999

Dr. Marion Moses is President of the Pesticide Education Center (PEC) in San Francisco, California. A physician, certified in Public Health and Preventive Medicine (specializing in Environmental and Occupational Medicine), Dr. Moses interest in pesticides began in the 1960s with her work with the United Farm Workers of America, affiliated to the American Federation of Labour-Congress of Industrial Organizations (AFL-CIO), in one of the largest agricultural areas in the world. She has many years experience investigating and documenting pesticide related illnesses in farm workers both short and long term. She has published widely on the adverse health effects of pesticide in humans, and is a consulting editor for the American Journal of Industrial Medicine, and the Archives of Environmental Health.

Inadequate Testing of Pesticides

A new study in the journal of Toxicology and Industrial Health identifies significant shortcomings in toxicological testing protocols currently used to register pesticides in the United States. The five year study, released in March 1999, suggests that combinations of commonly used agricultural chemicals in concentrations that mirror levels found in groundwater can significantly influence immune and endocrine systems as well as neurological health.

"The single most important finding of the study is that common mixtures, not the standard one-chemical-at-a-time experiments, can show biological effects at current concentrations in groundwater," said Warren Porter, lead author and University of Wisconsin professor of zoology and environmental toxicology.

The experiments performed by Porter's group suggest that children and the developing foetus are most at risk from pesticide-fertilizer mixtures. Their influence on developing neurological, endocrine and immune systems portend change in the ability to learn and in patterns of aggression. ***(See Box: Household Pesticides and Childhood Leukaemia)***

Chronic Effects in U.S. Farmworkers

Despite the fact that millions of farmworkers in the U.S. are exposed over extended periods of time to multiple pesticides, few studies have addressed the relationship between exposure and subsequent illness in this population. Although very limited data are available, studies which have been conducted show disturbing evidence of chronic effects of pesticide exposure among farmworkers. The following is a brief summary of some of the findings of studies on farmworkers done in the U.S.

Cancer: One cancer study conducted in the USA in 1993 found that when compared to the general population, both farmers and farmworkers have increases in multiple myeloma and cancers of the stomach, prostate and testis. In addition, farmworkers show unique increases in cancers of the mouth, pharynx, lungs and liver.

Birth defects and stillbirths: Although increased numbers of birth defects have been recorded among farm area residents, very few studies have looked at birth defects among farmworkers. In one study of 990 single births, limb reduction defects occurred among offspring of agricultural workers three to 14 times more frequently than among the general U.S. population. The risk was greatest for mothers residing in countries with high agricultural productivity (2.4 times) and high pesticide use (3.1 times). In another study, occupational exposure of pregnant women to pesticides during the first and second trimesters increased the risk of stillbirths and early neonatal deaths by 5.5 and 4.8 times respectively, compared to unexposed groups.

Developmental effects: Many pesticides are known to disrupt the human endocrine system. The endocrine system is a complex array of glands, organs and tissues that secrete hormones (chemicals produced by the body) into the bloodstream and regulate a range of physiological and neurological systems. Reproductive organs appear to be at particular risk for development abnormalities when pregnant women are exposed to endocrine-disrupticy chemicals (EDCs). In both sexes, the brain, thyroid, liver, kidney and the immune system are also potential targets for EDCs. Since EDCs persist in body fat, they may also exert their effects long after exposure.

Thus even with limited data available a startling picture emerges of the dangers facing farmworkers.

Source: "Fields of Poison, California Farmworkers and Pesticides", by Margaret Reeves and Kristin Schafer (Pesticide Action Network North America), Kate Hallward (United Farm Workers of America) and Anne Katten (California Rural Legal Assistance Foundation), Californians for Pesticide Reform (CPR) Series, 1998.

Household Pesticides and Childhood Leukemia

The use of pesticides in homes is generally increasing. They are used as indoor pest controllers, on indoor plants and in home gardens. However, exposure to some of these pesticides, particularly exposure before birth (foetal exposure) increases the risk of children developing leukemia, according to a recent study.

A comparative study of the pesticide exposure background of nearly 500 children with (acute lymphoblastic) leukemia and a similar number of children without the disease by a group of researchers from McGill University in Montreal, Canada, has shown that "indoor use of some insecticides ... and pesticide use in the garden and on interior plants increased the risks up to several-fold". The study was published in the journal, 'Epidemiology', in September,1999.

Sourcing the paper in the journal, 'The Sun', Malaysia, recently reported (1): "According to the authors, the use of insecticides in the garden and inside the house, particularly frequent pre-natal exposure, was associated with increased risks of leukemia. For example, foetal exposure to household cockroach, ant and/or wasp-fighting compounds during pregnancy increased a child's risk of developing leukemia by 79 per cent, the investigators report, compared with children without such exposure. The researchers also noted that foetal exposure to moth-killer compounds was associated with more than double the risk for childhood leukaemia. "Household insecticides used in the study included compounds such as organophosphorus, chlorpyrifos, diazinon, dichlorvos, malathion, cygon, propoxur, carbaryl and chlordane."

The study also found that such cancer risks were much higher in children who possessed genes linked to the activity of certain enzymes (P 450) which, they suggest, can activate the carcinogens in the pesticides. However another researcher, writing in the same journal, said that these results must be cosidered priliminary as the study was "one of the first, if not the first, to evaluate gene-environment interactions for pesticides and childhood leukemia".

Source: The Sun, Malaysia, August 23, 1999.

Fertilizer and Pesticide Combinations

The study focused on three commonly used farm chemicals: aldicarb, an insecticide; atrazine, a herbicide; and nitrate, a chemical fertilizer. All three chemicals are in wide use worldwide and are the most ubiquitous contaminants of groundwater in the United States.

In a series of experiments, when mice were given drinking water laced with combinations of pesticides and nitrate, they exhibited altered immune, endocrine and nervous system functions. Those changes, according to Porter, occurred at concentrations currently found in groundwater. Effects were most noticeable when a single pesticide was combined with nitrate fertilizer.

The apparent influence of pesticide and fertilizer mixtures on the endocrine system, the system of glands such as the thyroid that secretes hormones into the bloodstream, may also result in changes in the immune system and affect foetel brain development. "Thyroid disruption in humans has multiple consequences", Porter said. Some of these include effects on brain development, level of irritability, sensitivity to stimuli, ability or motivation to learn and altered immune function.

A curious finding of the study is that animals may be more vulnerable to the influence of such chemicals depending on the time of year: "Our current working hypothesis is that animals are seasonally vulnerable because of subtle modulation of natural seasonal variation in hormone levels," according to Porter.

Need for New Testing Methods

This new study, Porter contends, adds to a growing body of evidence that current testing methods required for the registration and use of chemical pesticides in the US are fundamentally flawed. The study lists 6 important deficiencies in current testing protocols.

- Current tests do not require chemicals to be tested at low dose pulse exposure. Pulse doses of low levels of pesticides at critical times when developmental windows are open and body defenses are unable to respond may lead to permanent changes in a foetus. It is important to remember that the embryo has almost no defensive systems against chemicals and no feedback systems to modulate chemical concentrations early in its development.
- Toxicological tests have typically focused on cancer and mutation endpoints and have not looked at other critical concerns such as endocrine and immune system effects that can occur.
- Standard toxicological tests only evaluate one route of exposure at a time, rather than all pos-

Flyers Beware! Pesticides on Aircraft

Airline passengers and crew can be exposed to hazardous pesticides without their knowledge, according to a report released by the Northwest Coalition for Alternatives to Pesticides (NCAP), USA. The report, "Flyers Beware: Pesticide Use on International and Domestic Aircraft and Flights" states that pesticides are commonly used on both cargo and passenger aircraft in the U.S and in other countries. Some airlines spray voluntarily, while others spray to comply with national regulations or requirements of other countries. Pesticides are used in occupied and unoccupied passenger cabins, galleys, cockpits and cargo holds.

On flights to at least six countries (Trinidad and Tobago, Grenada, Madagascar, Kiribati, India and Uruguay) passengers are directly sprayed with pesticides after landing while still strapped in their seats. According to one airline attendant, passengers' clothing, skin and hair may be soaked with the pesticide.

On flights to many other countries, passengers are exposed to pesticides sprayed prior to boarding without their knowledge. This type of spraying leaves long-lasting insect-killing residues in the passenger cabin. It is currently required on some or all flights to Australia, New Zealand, Jamaica, Barbados, Panama, Fiji and Guam.

Passengers on U.S. domestic flights may also be exposed to insecticides residues sprayed on aircraft.

Several insecticide active ingredients commonly used on aircraft, including permethrin, cypermethrin and piperonyl butoxicide, are classified by the U.S Environmental Protection Agency as possible human carcinogens. Others are classified as reproductive hazards or suspected endocrine-disrupting chemicals.

NCAP says airlines should use non-toxic pest prevention and management practices, and that governments should prohibit or discourage use of hazardous pesticides on aircraft.

Source: Northwest Coalition for Alternatives to Pesticides (NCAP) published in Global Pesticide Campaigner, April 1999.

The full report on aircraft spraying is available on NCAP's website at www.efn.org/~ncap/AirlineSpray.pdf. For further information contact: Northwest Coalition for Alternatives to Pesticides (NCAP), P.O. Box: 1393 Eugene, OR 97440. Tel: (541) 344 5044 Fax: (541) 344 6923.

sible routes i.e. oral, cutaneous and respiratory.

- Most testing is done with pure forms of pesticidal active ingredients rather than with commercial formulations. There are three types of chemical additives missing from most testing protocols; i.e. contaminants of manufacturing processes, toxic waste deliberately added from chemical reactor cleaning processes and "inert" ingredients.
- Current testing requirements do not evaluate exposure effects from chemical mixtures. While it is impossible to examine all possible mixtures, common combinations generated in specific areas due to crop rotation and tillage practices could be examined.
- Laboratory animals generally live in an environment where climate, nutrition and disease are carefully controlled. Researchers know that when additional stresses are present, toxic responses to registered chemicals occur that may not appear under current standard testing procedures.

"Toxicology testing so far has been extremely limited in scope and focused on mechanisms that require extensive mutations or cell damage to show any effects," said Porter. "They do not adequately assess the potential for biological effects under real world exposure scenarios." *(See Box: Flyer Beware! Pesticides on Aircraft)*

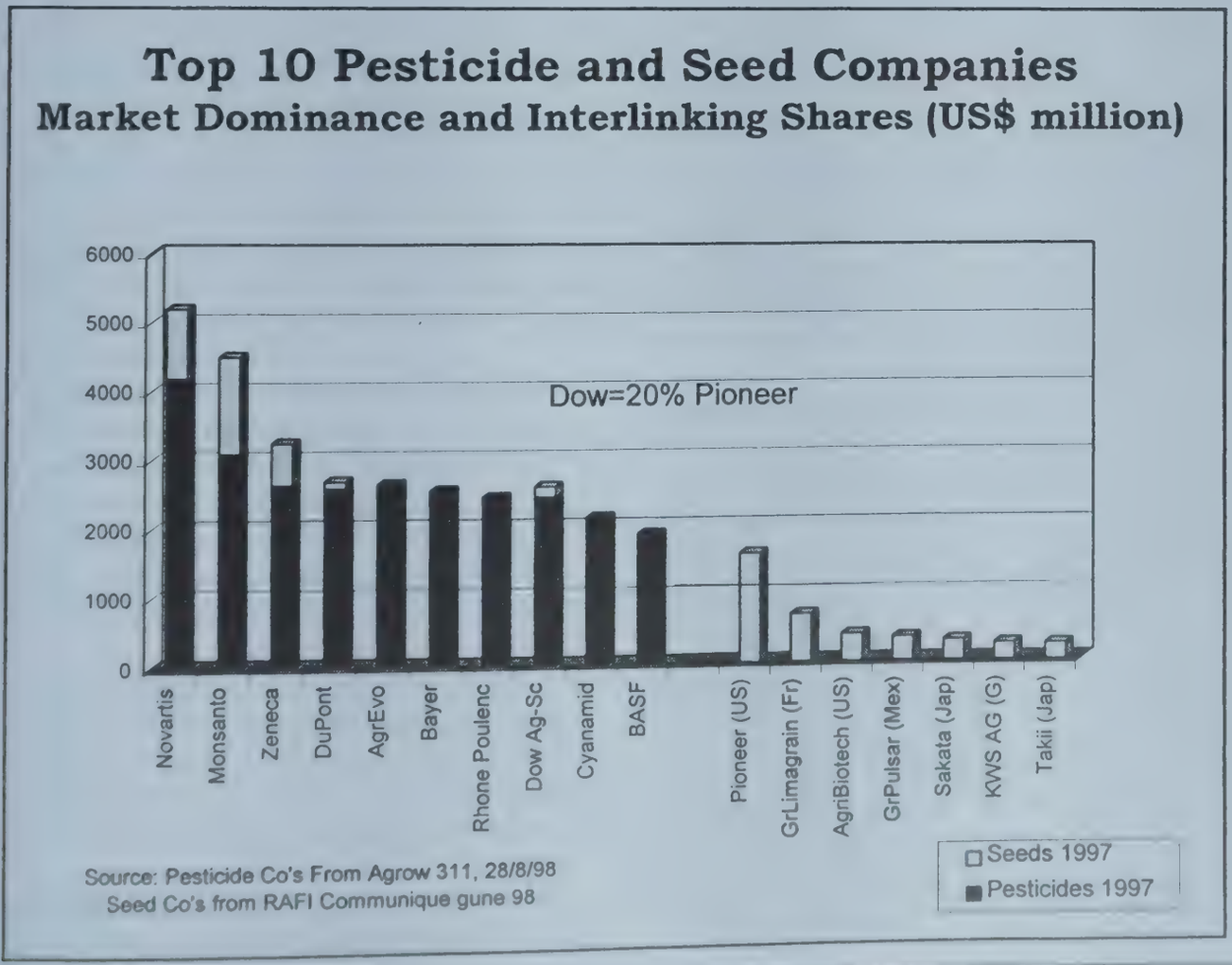
Source: Global Pesticide Campaigner, Volume 9, No. 1. PAN North America, April 1999, Original Source: Warren Porter et al., "Endocrine, Immune and Behavioural Effects of Aldicarb (carbamate), Atrazine (triazine) and Nitrate (fertilizer) mixtures at groundwater concentrations," Toxicology and Industrial Health (1999), 15, 133-150, University of Wisconsin-Madison Press Release, March 15, 1999.

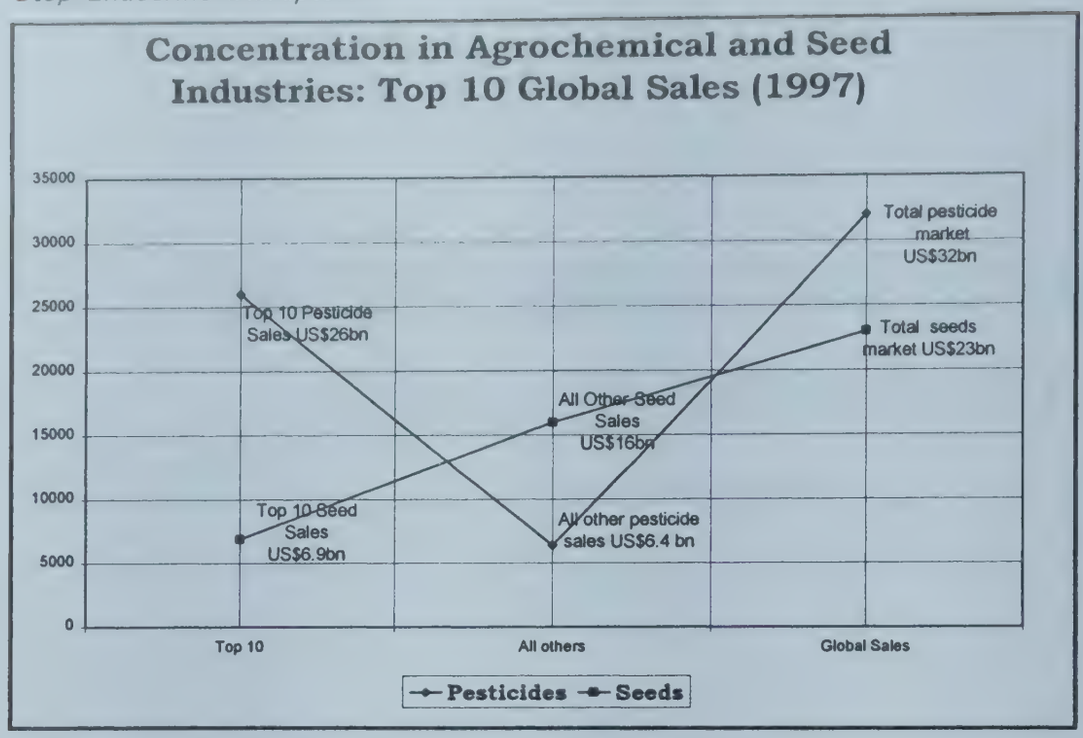
Impact of Corporate Control - The Pesticide TNCs

by Barbara Dinham

The challenge facing us is to achieve wider acceptance of the understanding that food security is about access to and distribution of food, and not about production. Industry promotes the view that increasing production can eliminate hunger, and many decision-makers accept this perspective. The vision of food security needs to be continually asserted against the barrage of productionist propaganda from the pesticide industry.

Agriculture is a complex sector. Unlike industry, agriculture is a way of life, it involves stewardship of the environment, it supports the rural social structure, and the products of agriculture feed the cities. In the forum of the World Trade Organization, these facts are disputed, and under the development of Uruguay Round Agreement on agriculture, the outputs treated like any other product. In the jargon of trade negotiations, this became reduced to an argument about the 'multifunctional nature of agriculture' – with pro-free traders refusing to acknowledge that protection was essential to protect the way of life intrinsic to agricultural production.





Part of the challenge to this view is continually drawing attention to the role of the transnational corporations that draw their profits from agriculture. Developments in this sector cut across the global agenda of liberalization, but to expand the companies constantly push for access to all markets.

Concentration and Control in the Pesticide Industry

In the last 50 years agriculture has been increasingly industrialized: first in Europe and North America and then with the development of Green Revolution techniques in developing countries. Monocultural production brought increasing use of agrochemicals and by 1997, the global sales of pesticides amounted to US$32 billion. The market is dominated by ten companies, which between them take about 80 per cent of global sales. These companies have elbowed out, or taken over, their competitors that do not have the financial resources to invest in the extensive research now needed to stay in the business.

These companies dominate the market, but there is also a growth of national pesticide industries in developing countries (India, Taiwan, China, South Korea, Mexico, Brazil) as well as a growth in the 'generic' pesticide producers. There is also an increase in the activities between the market leaders and companies appointed to market their older products.

The main markets for products remain in North America and Europe as regions; though India is now the second largest pesticide user in the world. As these markets are 'saturated', the big growth areas are targeted to be Asia and Latin America. The Chinese market is particularly interesting: China spends $6.7/ha on pesticides, compared to $752/ha in Japan, yet the Chinese yield is second only to Japan.[1]

The Seed Companies

More recently, concentration has begun to take place in the $23 billion seeds industry. Takeovers and mergers escalated throughout the 1990s and are continuing rapidly. In 1997, the sales of the top three companies accounted for 17 per cent, and are continuing rapidly. The companies were Pioneer Hi-Bred (20 per cent owned by DuPont), Monsanto and Novartis – all leading agrochemical companies. Changes in chemistry and economic, health and environmental pressures led these companies to develop a variety of strategies to continue extracting profits from agriculture.

The agricultural industries encourage monoculture, an agricultural system which inherently reduces agrobiodiversity (the FAO says more plant diversity has been lost to industrial agriculture than any other cause!), but which also increases pests attack and loss of beneficial animals (including insects) and crops. Some scientists have shown that reductions in biodiversity have led to the evolution of aggressive pests and diseases which are more difficult to control than those from which they have been derived. [2]

The full impact of a consolidation of interests is difficult to predict, but this trend now seems inevitable. One industry analyst observed: 'The days of seed companies selling commodity seed products that will be sprayed with pesticides marketed by a separate industry are clearly numbered. Seed companies are now selling seed brands engineered to express pest resistance genes or to be tolerant to specific herbicides'. [3]

The gains for industry could be phenomenal. Some industry analysts predict that the wave of agricultural biotechnology: herbicide tolerance and insect resistance traits could take the global agrochemical market up to a US$100 billion a year industry. [4]

Together the agrochemical and seed industries are reinventing themselves, and no longer market

1998 Top Ten Agrochemical Companies

Nearly all the major agrochemical companies increased sales in 1998, according to Agrow: World Crop Protection News. DuPont's combined agrochemical and biotechnology sales increased by over 25%, the highest rate of increase for the top ten corporations. DuPont recently announced that it had agreed to acquire the outstanding 80% stake in Pioneer HiBred International that it did not already own. Pioneer, the world's largest seed company with sales of US$1,835 million in 1998, controls about 42% of the U.S. maize seed market.

Monsanto's growth rate was a close second with combined agrochemical and seed sales increasing by more than 23% in 1998. This was due to a 25% increase in volume sales of the herbicide glyphosate (Roundup) and a tripling of the area planted with Monsanto's genetically modified crops.

Novartis was the overall sales leader in 1998 with pesticide sales reaching US$4,152 million and seed sales at US$1,005 million. Novartis, as well as Cyanamid, DuPont, Rhone-Poulenc and Zeneca were all hit by lower than expected herbicide sales in the U.S. due to low commodity prices and weather conditions as well as other factors.

Agrochemical and seed sales in Asia, Eastern Europe and Latin America were generally lower due in part to economic problems in these regions. However, Cyanamid, Dow AgroSciences, Novartis, Rhone-Poulenc and Zeneca all reported increased sales in Latin America. Cyanamid, Dow and Novartis also had high sales in Asia.

Top ten agrochemical companies — 1998 sales

Company	Sales*	% Change**
Novartis (Swiss)	$4,152	-1.1%
Monsanto (U.S.)	$4,032	23%
DuPont (U.S.)	$3,156	26%
Zeneca (U.K.)	$2,897	8.3%
AgrEvo (Ger)	$2,410	2.5%
Bayer (Ger)	$2,273	0.2%
Rhone-Poulenc(Fr)	$2,266	2.9%
Cyanamid (U.S.)	$2,194	3.5%
Dow Agro-Sci. (U.S.)	$2,132	11%
BASF (Ger)	$1,945	4.9%

* Millions of US$
** Since 1997

Sources: Agrow: World Crop Protection News, March 26, 1999 and April 16, 1999. Kindly forwarded via PAN North America (panupdates@igc.apc.org), May 7, 1999.

themselves as agrochemical and seeds companies, but as the LIFE SCIENCES companies: playing with life through the manipulation of genes.

Corporate Strategies for Influence

The interest in expanding from the pesticide market to other areas of profitability can probably be traced back to the early 1980s, when environmental concerns began to influence the agrochemical industry. This period began to see the division between research-based agrochemical companies and others; the cost of bringing new products onto the market was a high but essential, price to pay for staying in the game. Companies opting for this route inevitably sought ways to cover the cost of the research. With relatively flat sales through the eighties, a range of expansionary and defensive strategies were devised which kept the industry in a dominant position. Being a 'life science' company implied heavy investment in research. So the underlying tactics continue:

- Expansion of sales of older products, whose research costs have been recouped. These are cheaper and sell particularly well in developing countries. Most companies aim to increase sales in developing countries, particularly, but not exclusively, of older products. The lucrative Asian market has been a major target.
- Registration requirements. Industry faces tighter registration requirements. Its response is to promote the 'science' of risk management as the basis for product acceptability. The worker and consumer demand for precedence of the precautionary principle is undermined in the face of widespread regulatory acceptance of the infallibility of 'science', which puts regulators in a defensive position. Speaking at the British Crop Protection Council conference in 1997, B. Thomas of AgrEvo noted that data requirements on environmental fate and ecotoxicology have increased in recent years, particularly in Europe, and that industry is collecting data to lobby for a relaxation of the criteria.

The Public Image

Aware of the poor image of pesticides triggered by Rachel Carson's *'Silent Spring'* and sustained by publications such as *'A Growing Problem'* and the work of PAN, the agrochemical industry was on the defensive for some time through the 1980s. It is now more aggressively repackaging itself to claim the moral high ground. Its approaches seek to persuade decision-makers, and the public, that the industry is benign and promotes the common good through claims like:

- ***Feed the world***
- ***Protect the environment***
- ***Can be used safely in developing countries***
- ***Are IPM friendly***

Examples of advertising of pesticides by the ICI company that drew heavy criticism from citizen groups and the PAN Global Network. The poster above came from a shop of an ICI distributor in Quetzaltenango, Guatemala, 1992. The advert below, stating that "paraquat works in harmony with nature", was the focus of action by Consumer groups in Malaysia in 1993.

Feeding the World

A key approach is the public relations strategy: winning hearts and minds by 'demonstrating' that pesticides are essential in the battle to feed the 'world's relentlessly increasing population'. This public relations onslaught will continue as companies seek to gain the moral high ground: convincing the public and decision makers that pesticides are needed because only by use of high input agriculture will a population of 8 billion (estimated global population in 2020) be fed. However, food production in China has kept pace with population growth, while meeting policy objectives of maintaining reserves of 17 per cent of a year's food needs.

Protecting the Environment

Companies argue that intensive agriculture will prevent expansion onto wilderness areas, which are an important residue of biodiversity.

Safe Use

Industry recognizes that pesticides have caused health and environmental problems in developing countries, and safe use campaigns are intended to address bad press. This can be a cheap and effective way of advertising. As one company spokesman said: "If we teach farmers to use pesticides correctly, there will be no lack of customers for our products; indeed there might well be an increased demand for the safer and more sophisticated products which we are now making", David McDonald – Novartis (Ciba Plant Protection Farmer Support Team established in 1991)

Industry has invested mainly in only three safe use projects under the Global Crop Protection Federation (GCPF): in Kenya, Thailand and Guatemala. These projects promote awareness of protective clothing; pre-harvest intervals; labeling; good practice on mixing and spraying, 'not decanting' pesticides, training distributors, improving registration, raising formulation standards. The safe use programmes provide an opportunity to promote pesticide use much more cheaply than through advertising, for example, children can be targeted through the school curriculum: many companies provide cartoon comic papers to schools. Furthermore, government or development agency funds can be sought to support safe use programmes, in direct competition with funding alternatives. The approaches learned from these countries are being applied in other countries. Industry should pursue safe use programmes, but real cost of pesticide use should be reflected in the products, and not compete with the potential to train farmers in Integrated Pest Management (IPM) alternatives which will reduce or eliminate pesticide use.

Corporate IPM

When presenting information at a global level, industry asserts the importance of IPM and the GCPF encourages all products to be marketed under an IPM umbrella. Some companies, notably Novartis and Zeneca, have developed a small number of flagship IPM projects. These have generally been in areas where profound problems have been identified as a result of pesticide overuse. The industry approach to IPM is based on management of pesticides, mainly to ensure that pests do not develop resistance to pesticides. Their work undermines the work by the FAO, many other research institutes and NGOs which have developed an approach to IPM based on no, or minimal, use of pesticides. These alternatives draw on farmer-participatory, knowledge-based strategies which make full use of agricultural biodiversity, beneficial insects, understanding of economic loss, principles of rotation and other good farming practices.

What Industry Doesn't Like?

- ***The precautionary principle***
- ***'Cradle to grave' responsibility for products***
- ***Economic instruments such as pesticide taxes and subsidies for ecological agriculture***
- ***Regulation – instead "always opt for voluntary controls. But codes are also important"***

Strategies for a Sustainable Future

In spite of industry's assertions, most decision-makers recognize that access to food is as important as production. However most could not envisage a pesticide-free agricultural strategy. In the last 50 years, agrochemicals have become so much part of production, that the way out of dependence will take some time, many strategies, and struggles on different fronts. These could include

- Documenting the continuing health and environmental costs of pesticides.
- Demonstration of the continued environmental threats of pesticides, which include, e.g. loss of wild and 'free' food e.g. wild fruits, berries and fish.
- Water pollution: effect on health of humans and animals.
- The benefits of agricultural biodiversity.
- Emerging knowledge: the impact and costs of past ignorance: pesticides, POPs.
- The importance of on farm inputs including recycling of nutrients, preservation of beneficials, and farming knowledge that debunks the myth that low input = low output. Demonstration of successful IPM alternatives should be emphasized.
- Issues related to Food Security. Access is the key word: i.e. access to food, to natural resources and land, access to education, water, credit, seed supplies, technology; access for women; and access to mechanisms of public decision making.
- Developing hunger maps and documenting case studies of impacts: i.e. who are winners and losers at regional/national and sub-national level?
- Asserting the multi-functional role of agriculture: i.e. it is about livelihoods, sustainability and a way of life. Developing countries need to push for recognition of the multi-functional role of agriculture.
- Governments to regulate TNC activities: point to role of TNCs in global trade – it is absurd to pretend that trade is merely between governments.
- Codes of conduct: government, industry and civil society – with adequate monitoring.
- Legally binding mechanisms: e.g. trade rules with environment and social rights.
- Trade rules which provide guidance, not to increase or decrease trade.
- Alliances with sympathetic stakeholders: the public sector and non-corporate agricultural research institutions; development agencies, UN institutions, and academics.
- Influencing the influences: e.g. World Bank, development banks, and government policy makers.

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STOP PESTICIDES USE
END THE CYCLE OF POISON
PAN
ASIA AND THE PACIFIC

Section Two

Challenge for the Millenium: Endocrine Disruptors

Endocrine Disruption: New Threats From Old Chemicals

by Dr. Michael Smolen

Through a series of accidental discoveries, researchers stumbled on the fact that some widespread, man-made chemicals, called "endocrine disruptors", can interfere with the body's own hormones and jeopardize health. In the past five years, the scientific investigation of this problem has intensified and provided steadily growing evidence linking these synthetic endocrine-disrupting compounds to impaired health in wildlife and people. The exploration is ongoing and far from complete...

"Chemicals that compromise life – A call to action", World Wildlife Fund.

Reports of disturbing global trends in human health are appearing regularly in government reports, scientific papers, and even the news media. During the past few decades, increases have been recorded in the incidence of prostate, testicular and breast cancers [1], developmental problems such as hypospadias and undescended testicles [2] – forms of genital malformations, and reported global declines in sperm quality and quantity[3,4]. Scientists now have an explanation that could account for many of these problems: *disruptions to the developing endocrine system.*

Discussion of this hypothesis has previously been confined to scientific literature, and only in the last few years has it seeped into the policy and public arenas. This visibility has been greatly increased with the publication of a book, "Our Stolen Future: Are we threatening our fertility, intelligence and survival?", written by Theo Colborn, Dianne Dumanoski, and John Peterson Myers. This book presents the scientific evidence supporting concern for the endocrine-disrupting effects of some man-made chemicals. Written specifically for the general public, it has already sparked much debate.

The Endocrine System and Endocrine Disruption

The endocrine system is the body's chemical "messenger system" of hormones and other special messengers, which help communication be-

What Are Hormones?

Hormones are naturally-occurring chemicals that circulate at very low levels in the blood stream of all vertebrate animals including reptiles, amphibians, fish, birds and mammals. (Vertebrates are animals with a backbone.) In all vertebrate species, hormones act as chemical messengers and as switches, turning on and off bodily systems that control growth, development, learning and behaviour. Hormones start affecting every animal shortly after it begins life as a fertilized egg. Hormones control growth and development prior to birth or hatching, and hormones continue to influence behaviour throughout life. Hormones tell bears when to hibernate, tell salmon when to return to their spawning grounds, and cause women to menstruate every 28 days or so. Hormones profoundly affect the nervous system, the reproductive system, and the immune system. Naturally-occurring hormones are also implicated in some forms of cancer, such as female breast cancer which is widely believed to be linked to a woman's lifetime exposure to estradiol (estrogen), the main female sex hormone.

Source: 'Hormonally Active Agents In The Environment', Ernst Knobil and others, Washington, D.C.: National Academy Press, July 1999. Page 197.

Diagram 1: Important glands, organs, and tissues sending or receiving hormonal messages in the human body

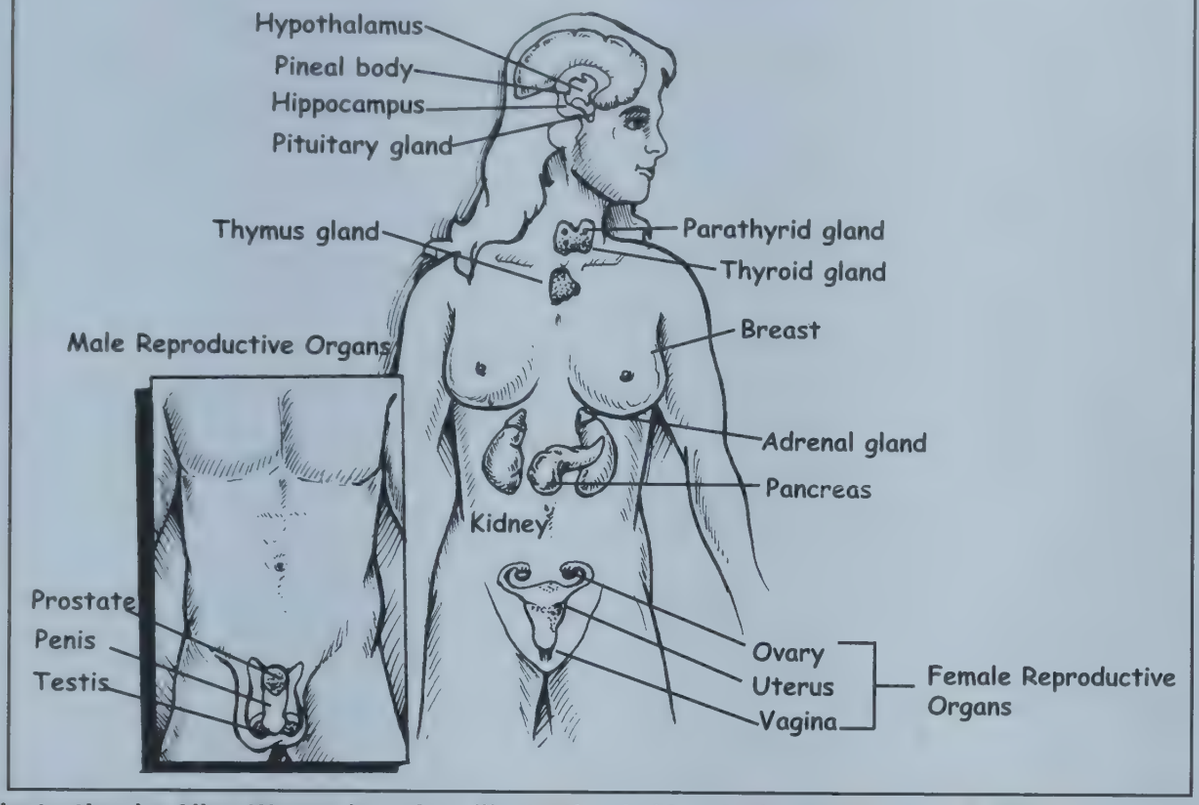

Illustration by Allan Woong based on illustration in 'Our Stolen Future- Are We Threatening Our Fertility, Intelligence, and Survival?-A Scientific Detective Story, Dutton U.S., 1996.

tween the various parts of the body. The system involves a variety of organs, called endocrine glands (the thyroid, thymus, pituitary, adrenal, the testicles, ovaries, etc) that release the hormones to be carried in the bloodstream to specific target sites (cells) in the body. ***(See Box: What are Hormones?)***

Latching on to unique "receptors" at the target site, the hormones signal and govern various processes and functions such as growth and development (including brain development), metabolism, reproduction, immune system, etc. *(See Diagrams 1 and 2).*

Distantly related groups of living things like birds, mammals and humans share almost identical hormone and receptor systems, and similar biological responses. Disruption of this finely balanced endocrine system occurs when biologically active foreign chemicals interfere with the body's messenger system of hormones, and this can lead to developmental, reproductive, behavioural, immunological (i.e. effecting the immune system) and physiological changes.

However, chemicals have always been assessed for safety based only on whether they cause cancer, poison people outright or produce obvious developmental abnormalities[5]. Toxicologists use high doses of chemicals to assess their effects and, when no effects appear, the chemicals are considered safe until proven otherwise. Examples of the effects of foreign chemicals on the endocrine system have always been portrayed as novelties or rarities of nature.

Thus when fleas, which were living on rabbits,

Diagram 2: The Lock-and-Key model of hormone-receptor interaction necessary for a hormone to trigger biochemical activity in a cell

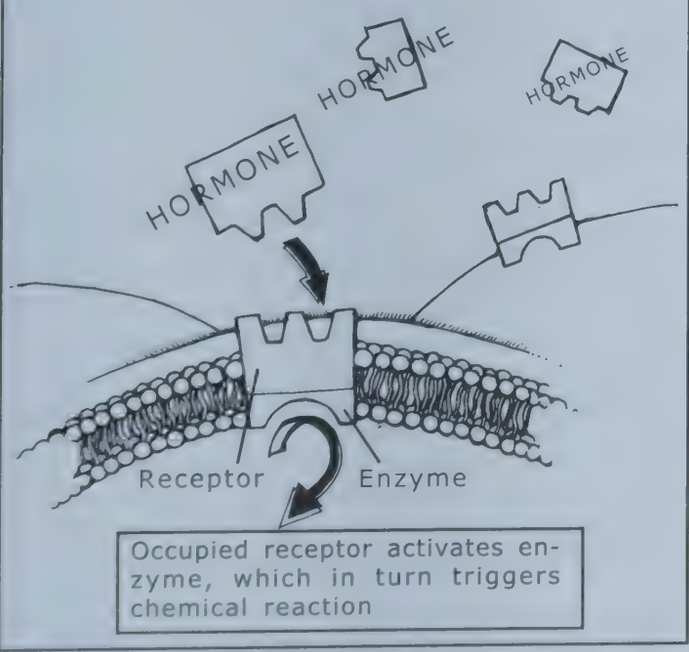

Illustration by Allan Woong based on illustration from 'Generations at Risk: How Environmental Toxicants May Affect Reproductive Health in California', A Report by Physicians for Social Responsibility (L.A. and San Francisco), and The California Public Interest Research Group Charitable Trust, 1999.

DES and Vaginal Cancer

From 1950 – 1971 diethylstilbestrol (DES), a synthetic estrogen with a chemical structure considerably different from naturally-occurring estrogen, was used in an attempt to prevent spontaneous abortions in women. An estimated 5-10 million Americans were exposed to DES during pregnancy (DES mothers) or in the uterus (DES daughters or sons). [1]

No harmful effects of DES exposure were suspected until 1970 when a rare form of vaginal cancer was reported in six young women, ages 14 – 21, who had been exposed to DES in the uterus. [2] Previously, this disease had occurred almost exclusively in older women, but it is now know to be caused in younger women by exposure of the developing foetus to DES. The risk for developing vaginal cancer from birth to age 34 is estimated to be 1 in 1000 to 1 in 10,000 for women exposed in the uterus – accounting for thousands of cases in the U.S. alone.

Later studies demonstrated that DES daughters often have abnormalities of their reproductive organs, reduced fertility, and unfavourable pregnancy outcomes including ectopic pregnancies, miscarriages, and premature birth, as well as immune system disorders. DES sons are more likely to have small and undescended testicles, abnormal semen, and hypospadias.[3] DES mothers have a breast cancer risk about 35 per cent greater than those not exposed.[4] Animal studies in mice and monkeys show that prenatal DES exposure may result in masculinization of parts of the female brain and feminization in males.[5] Several studies in humans suggests similar results.[6]

Some DES daughters and sons are now in their mid-20's. Many do not know that they were exposed in the uterus. Their health status require careful attention. As yet there is no definite evidence for adverse health effects in the offspring of those who themselves were exposed to DES in the uterus (DES grandchildren). However, since many are still young, it is too early to draw final conclusions and the issue is not resolved.

DES is an example of an estrogenic chemical which causes reproductive and developmental abnormalites, immune system malfunction, and cancer in some people exposed as foetuses.

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Source: Generations at Risk: How Environmental Toxicants May Affect Reproductive Health in California, A Report by Physicians for Social Responsibility (L.A. and San Francisco), and The California Public Interest Research Group Charitable Trust, 1999.

For more information visit the following websites: http://www.igc.apc.org/psr/index.html or http://www.pirg.org/pirg

were discovered to use the hormones in rabbits to signal their own reproductive cycle, that was an amazing fact of natural history. When DES (diethylstilbestrol), an estrogen-like synthetic molecule given to pregnant women to guard against miscarriages, was found to alter the development of their offspring[6], that was considered an unfortunate side-effect of a drug. ***(See Box: DES and Vaginal Cancer).*** When sheep and cows developed reproductive problems after eating plants rich in plant estrogens, that was a problem in animal husbandry.

But disruptions to the endocrine systems are not isolated or rare events. Today there is concern that animals and people are experiencing disruptions to their endocrine systems, leading to the changes mentioned earlier. ***(See Box: Wildlife Health Effects).*** Although a number of natural chemicals in plants (i.e. phytoestrogens like genistein, daidzein, and coumestrol) can also interfere with the endocrine system in vertebrates, the main concern now is with man-made chemicals which our bodies had never before encountered. And this concern is not limited only to persistent chemicals that build up to high concentrations in the body but also to many short-lived ones which, while they are in the body, can disrupt the endocrine system.

So in 1992, a group of scientists with expertise in varied fields (from anthropology, endocrinology, medicine, immunology reproductive physiology, and histopathology) met to explore the potential for endocrine system disruption in humans and wildlife. They concluded that: "A large number of man-made chemicals that have been released into the environment, as well as a few natural ones, have the potential to disrupt the endocrine system of animals, including humans"[7]. These chemicals include a variety of pesticides and industrial chemicals. Published research convinced the scientists that wildlife populations have been affected, examples of which included:

- "thyroid dysfunction in birds and fish;
- decreased fertility in birds, fish, shellfish, and mammals;

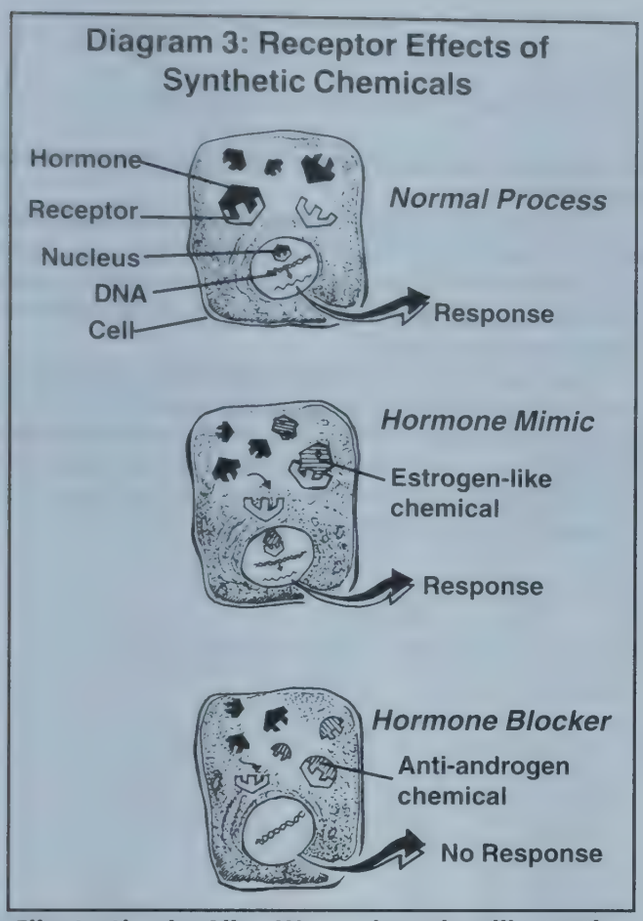


Illustration by Allan Woong based on illustration in 'Our Stolen Future- Are We Threatening Our Fertility, Intelligence, and Survival?-A Scientific Detective Story, Dutton U.S., 1996.

- gross birth deformities in birds, fish, and turtles;
- metabolic abnormalities in birds, fish, and mammals;
- behavioural abnormalities in birds;
- demasculinization and feminization of male fish, birds, and mammals;
- defeminization and masculinization of female fish and birds;
- and compromised immune systems in birds and mammals"[7].

Man-made chemicals can interfere with the endocrine system in a number of ways. The hormones or messengers in the body have a complex feedback system, which closely controls their release and persistence in the body. Some man-made chemicals can mimic the natural hormone and activate biological processes (some can even super-activate the processes). Others can merely bind to and block the receptors so that the natural system can no longer be turned on. Yet others may react directly or indirectly with natural hormones or alter natural patterns of hormone synthesis. *(See Diagram 3).*

Problems for the Unborn

Reports of endocrine system disruptions involve development of a baby can thus have pronounced

Wildlife Health Effects

A variety of invertebrates, reptiles, birds, fish and mammals have been adversely affected by Endocrine Disruptors (EDs). The following examples illustrate the diversity of health effects:

- **Various types of snails exposed to environmental levels of tributyl-tin, an anti-fouling additive used in marine paint on ships, develop a condition called imposex in which affected female snails have irreversibly superimposed male sex characteristics.**
- **Hermaphroditic (having both the male and female sex) fish are found in rivers below sewage treatment plants in Great Britian. Vitellogenin, a protein normally synthesized by female fish in response to estrogen, is utilized as a yolk protein to nourish the developing fish. Male fish have vitellogenin levels similar to gravid females in some rivers. Laboratory tests show that nonylphenol, an alkylphenol used in detergents and surfactants and found in effluent, behaves as an estrogen mimic and induces vitellogenin formation and testicular inhibition in male trout. However, it is not entirely clear which chemical or combination of chemicals in the sewage effluent mixture is responsible for the observations in river fish. Some investigators believe that estrogens from the urine of women taking birth control pills also contribute.**
- **Alligators and red-eared turtles in Lake Apopka in Florida are demasculinized after exposure to a mixture of chemical contaminants including the pesticide, dicofol. There are no normal male turtles in Lake Apopka. All hatchlings have either normal appearing ovaries or are intersex.**
- **Gulls breeding in the Puget Sound and Great Lakes regions show evidence of eggshell thinning and reproductive tract abnormalities with feminization of male embryos. In some instances, populations have declined and sex-ratios are skewed. These areas are contaminated with mixtures of DDT, PCBs, and polycyclic aromatic hydrocarbons, each of which may cause the observed effects. Birds from these areas and from locations far more remote from industrial activity show elevated tissue levels of contaminants.**
- **Great Lakes gulls and terns, as well as some western gulls, have, within the past several decades, shown supernormal egg clutches and female-female paring. Gulls in these colonies also show excessive chick mortality, birth defects, and skewed sex ratios, with an excess of females. These effects correlate with levels of persistent organic pollutants like PCBs and DDT.**
- **Seal populations have markedly declined in portions of the Wadden Sea in the Netherlands. Fish from the area of decline are contaminated with higher levels of PCBs and pesticides than those from other areas. Captive seals fed fish exclusively from the contaminated areas were less able to reproduce and had altered estrogen levels compared to seals fed less contaminated fish over a two year period.**

Source: Generations at Risk: How Environmental Toxicants May Affect Reproductive Health in California, A Report by Physicians for Social Responsibility (L.A. and San Francisco), and The California Public Interest Research Group Charitable Trust, 1999.

See also the following websites: http://www.igc.apc.org/psr/index.html or http://www.pirg.org/pirg

Pesticide Exposure May Impair Children's Brain Function

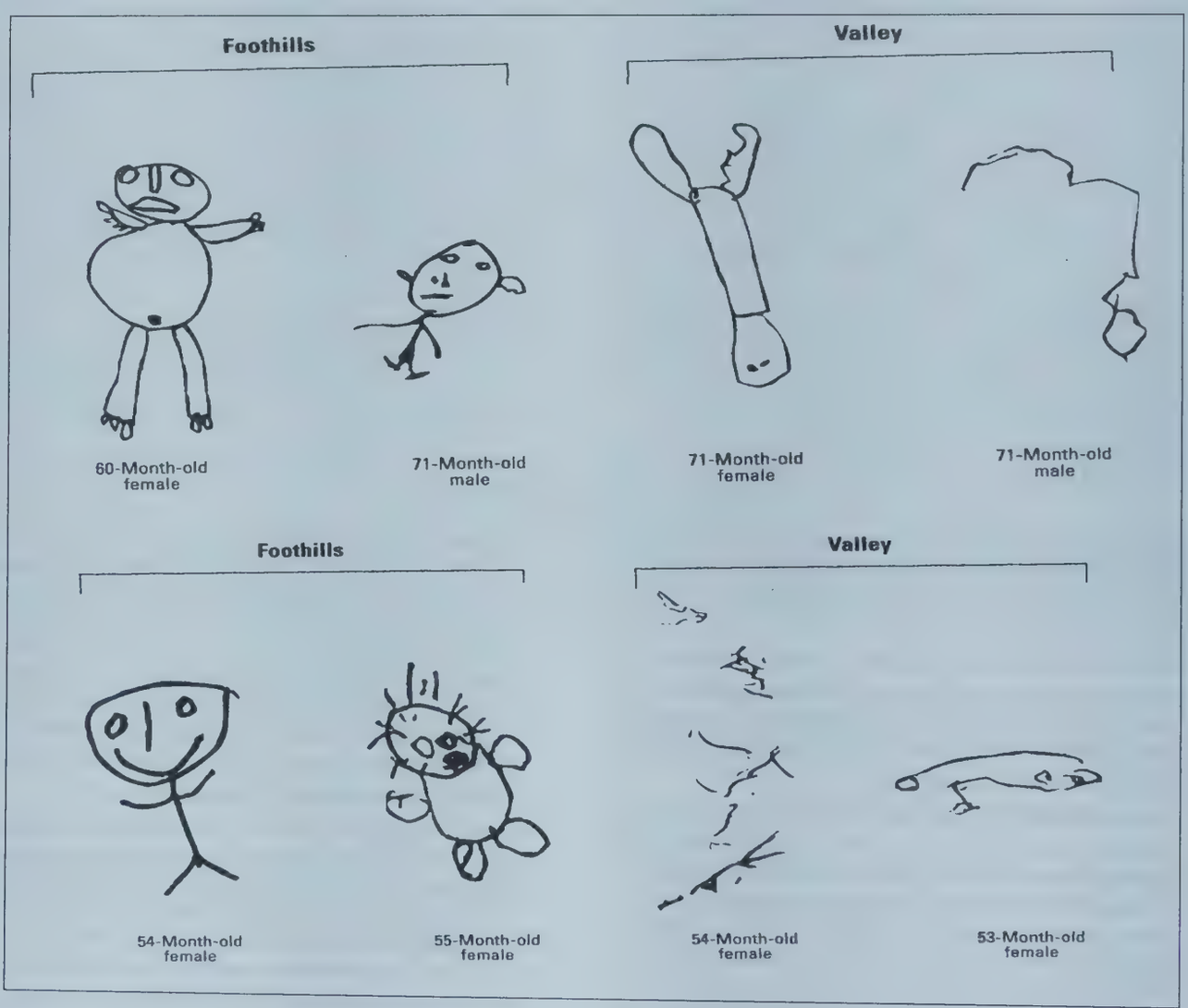
Dramatic deficits in brain function are seen in rural children with long-term exposure to pesticides compared with children not similarly exposed, according to a recent study in "Environmental Health Perspectives." The study compared two groups of four-and-five-year old children in the Yaqui Valley of Sonora, Mexico, who are very similar except in their levels of pesticide exposure. The children share a common genetic and cultural background, eat the same foods and drink the same water. The major difference was in their exposure to pesticides.

Thirty-three of those studied lived in the valley, a farming area where pesticide use was relatively intense. Farmers reported that two crops a year may be planted with up to 45 pesticide applications per crop. Organophosphates, organochlorines and pyrethroids were among the chemicals used. In addition, household insecticides were usually applied each day throughout the year. Contamination of the local population had been documented, with women's breast milk containing concentrations of lindane, heptachlor, benzene hexachloride, aldrin and endrin all above limits established by the UN Food and Agricultural Organization.

The second study group (17 children) lived in the foothills, where most families were involved in ranching and pesticide use was minimal. Foothill residents used traditional methods of intercropping for pest control in gardens and rarely used insecticides indoors. Residents stated that their only exposure to pesticides was annual government spraying of DDT to combat malaria (this programme was also carried out in the valley).

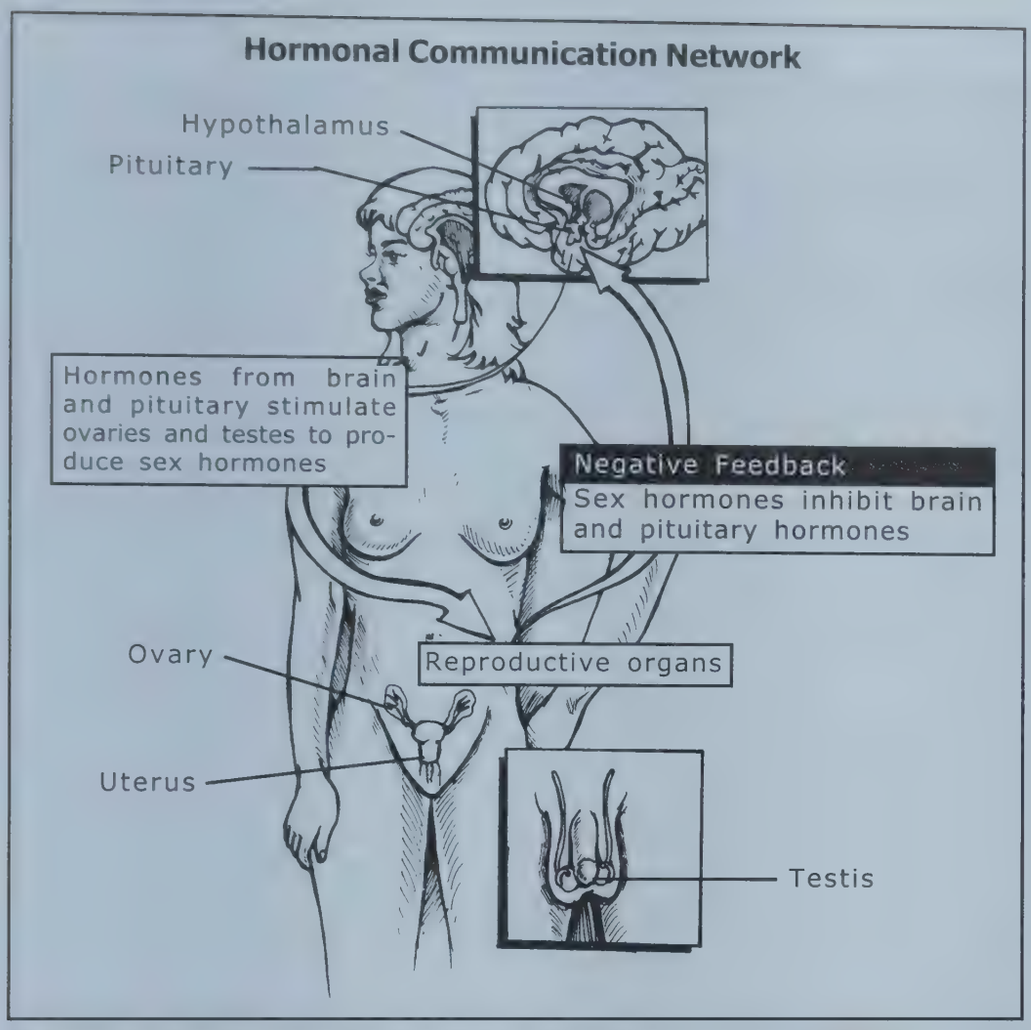
The researchers developed and used a Rapid Assessment Tool to measure the growth and development of these two groups of children. Although the groups were similar in physical growth, a comparison of their functional abilities showed some marked differences.

The valley children showed: less stamina (or physical endurance, measured by making the child jump in place for as long as possible); lower motor or hand-eye co-ordination (ability to catch a large ball from a distance) and even lower fine eye-hand co-ordination (ability to drop a raisin into a bottle cap); and poorer short-term memory.



One of the most striking differences between the two groups was the ability to draw a person. The valley children showed much less ability to draw a person than the foothill children (see drawings); even while looking at a person and drawing, the valley children "continued to draw meaningless circles". Some of the valley mothers later told the researchers about their frustration in trying to teach their children how to draw. The decreased eye-hand co-ordination and ability to draw could indicate impairment of brain function among the pesticide-exposed valley children, say the researchers.

Source: Environmental Health Perspectives, Volume 106 Number 6, June 1998; and Global Pesticide Campaigner, Pesticide Action Network (PAN) North America, September 1998.



A negative feedback loop in hypothalamic-pituitary-gonadal (HPG) hormonal communications tends to keep sex hormons at constant levels. In males, the feedback loop is always negative. In females, it fluctuates between negative and positive. Illustration by Allan Woong based on illustration from 'Generations at Risk: How environmental Toxicants May Affect Reproductive Health in California', A Report by Physicians for Social Responsibility (L.A. and San Francisco), and The California Public Interest Research Group Charitable Trust, 1999.

the more familiar thyroid, estrogen and testosterone hormones as well as less well understood developmental messengers. One such specialized developmental messenger (Mullerian inhibiting substance) is released in the developing male foetus to signal the resorption of the embryonic tissue that would otherwise produce a female reproductive system. All embryos have the potential to become either male or female, and simultaneously develop two separate kinds of tissues, one that will give rise to male and the other to female reproductive systems.

Early in life, a developmental switch is thrown (under the direction of the sex chromosomes) signalling the right set of tissues to develop the appropriate reproductive organs while tissues fated for the opposite sex are signalled to self-destruct. The switch sets in motion specific activities along a number of endocrine pathways, and the resulting chorus of messengers directs the further constuction of the anatomy, physiology and behavioural traits relevant to that sex. Disturbance to these hormonal ebbs and flows confounds development and causes potentially serious problems. For example, crossed messages signalling the development of parts of both sexes can cause "feminization" and "demasculinization" of males or "defeminization" and "masculinization" of females, the offspring acquiring an intermediate or "intersex" design compared to what was to be by genetic inheritance alone. ***(See Box: Edocrine Disruptors and Genital Birth Defects)***

Similarly, disturbance to thyroid, estrogen, testesterone and other harmone systems can cause reduced growth, birth defects, functional abnormalities, altered behaviour, reduced fertility, learning disabilities ***(See Box: Pesticide Exposure May Impair Children's Brain Function)***, lower intelligence and greater susceptibility to diseases.

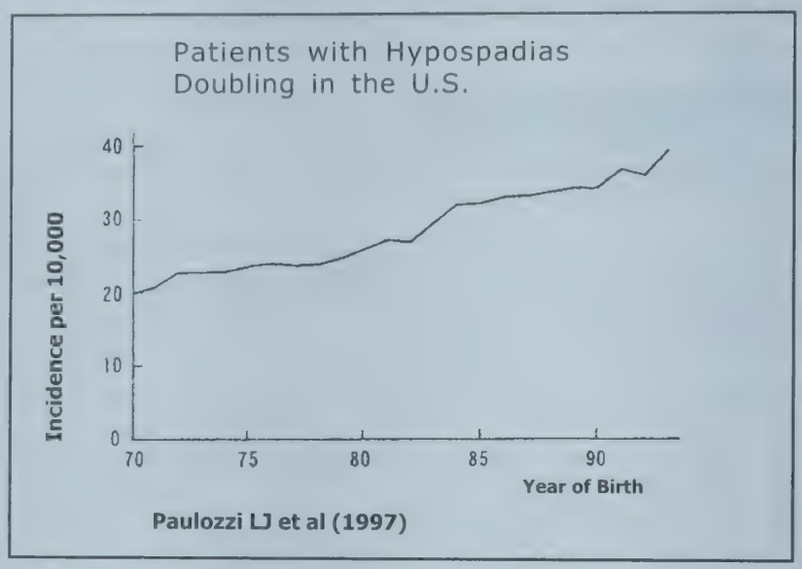
Of all these endocrine-disruption effects, the most serious arise from changes occurring during development. Endocrine disruption can occur in adults, but these typically require higher concentrations of the chemicals, and when these chemicals are removed from the system, the effects may disappear. The threat to the developing foetus is more severe in that the changes caused during this stage cannot be undone later. These effects are typically irreversible and permanent [8]. ***(See Box: Suffer the Little Children...)***

Concern for Women

This is a cause for special concern for women who use, mix or spray pesticides. Chemicals are readily adsorbed into the body and can be easily passed on through the bloodstream to the foetus or to breast tissue from where it can pass into breast milk and to suckling babies. Pesticides are designed to be biologically active in order to kill pests, and many of them have been discovered to affect the developing endocrine, reproductive, neural and immune systems. Exposures to endocrine disruptor chemicals during the critical stages of growth and

Edocrine Disruptors and Genital Birth Defects

In 1997, a group of researchers at the U.S. Centre for Disease Control and Prevention, lead by Len Paulozzi, reported that cases of male genital birth defects (known as hypospadias) among boys in the US was increasing, and had doubled between 1970 and 1993 – from 20 cases per 10,000 births in 1970 to 40 cases in 1993 (see chart below). Rising rates of hypospadias have also been reported from European countries.



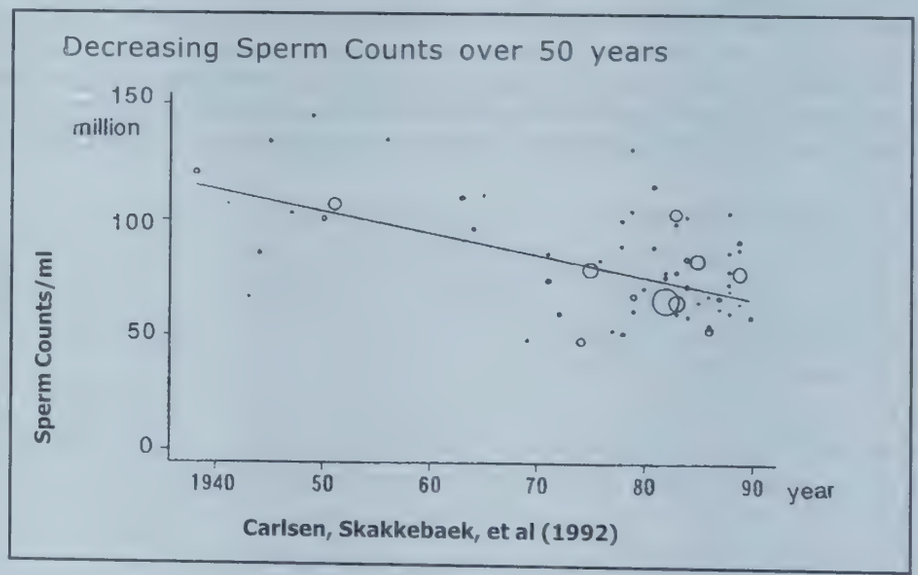
Hypospadias is a genital defect in males where the urinary opening is misplaced on the underside of the penis instead of at the end or, in some cases, located in the scrotum. This condition has been linked to the inadequate release of the male hormone testosterone during a critical period of foetal development – between the 56th and the 80th day after conception when the urogenital tract develops in the foetus. This leads to the "incomplete masculinization" of the male genitals.

"As you block the foetus' own testesterone, the foetus cannot masculinize itself, and you end up getting these various states of feminization of the foetus, of which hypospadias is a mild form", says Paulozzi. Undescended testicles, where the testes do not descend into the scrotum and are retained within the abdomen, vaginal pouches where the penis is covered with a layer of fat, cleft penis, reduced seminal vescicles, etc are among the other features of this incomplete masculinization or "feminization" of the male genitals. Also cases of such genital defects seem to be increasing according to various reports. Such defects have also been found to occur in animal studies using pesticides such as DDT (and its breakdown product DDE) and vinclozolin, a fungicide used commonly on fruits and vegetables.

Similarly, cancer of the testicles in men has been found to be increasing in several countries and the incidence of testicular cancer has been found to be higher among men with developmental defects such as hypospadias and undescended testicles. Researchers say that this indicates that the higher rates of testicular cancer have something to do with events in early life or in the womb itself. Here again, laboratory studies with animals have indicated that estrogens may have a major role in promoting testicular cancer.

Meanwhile, studies done by Frederick vom Saal at the University of Missouri, USA, have shown that mouse foetuses exposed to very small doses of estrogen-like chemicals developed enlarged prostates and the mice later had declined sperm counts.

Decline in sperm counts in men has also been found in studies of semen samples from various regions of the world. In 1992, Danish endocrinologist, Niels Skakkebaek and his colleagues analyzed various studies of semen quality (covering 15,000 men from 20 countries) published over the previous 50 years and found that the mean sperm count had declined nearly 50 percent worldwide over that period – from 130 million/mL in 1940 to 66 million/mL in 1990. This study turned out to be very controversial; while some smaller scale and localized studies of semen quality that followed found a decline in sperm count, a few others did not.



However, in 1997, Shanna Swan and her group at the California Department of Health Services, USA, reviewed and re-analyzed Skakkebaek's data for sperm count, taking into account regional variations in sperm count, and came to the conclusion that there was indeed a sharp drop in sperm count worldwide; if anything, they found, the drop could be sharper than what was estimated by Skakkebaek.

Source: K. Prabhakar Nair, varied researched references, 1999. Graphs taken from Japan Offspring Fund (JOF) information posters for their Endocrine Disruptors Campaign.

Suffer the Little Children...

Theo Colborn, a researcher at the World Wildlife Fund (WWF), has been closely following and synthesizing research on endocrine-disrupting chemicals around the world for years. She put together, for the first time the mounting evidence, collected from all over the world, for the endocrine-disrupting effects of synthetic chemicals, including pesticides and industrial chemicals, in her book, "Our Stolen Future". In this extract here, taken from her interview with "Mother Jones", a U.S. magazine, she talks about the implications of these endocrine-disrupting effects of synthetic chemicals. She says:

"We are neutering the population (as a result of the interference of some organic pollutants and industrial chemicals which act like hormones); we are making females more masculine and males more feminine.

Up until the 56th day from the day of conception, you can't tell the sex of the foetus. The tissue that is there is going to eventually produce testicles or ovaries. It takes just a slight tweak of a hormone to make it grow into a male tissue and become a testicle; a tweak in the other direction, and it will become female tissue.

What we are finding in fish and birds and even mammals now are ovotestes, or testes that have ovarian tissues in them. We have uncovered a new series of subtle effects, which probably take place during embryonic and foetal development and which have long-term effects that keep an individual from reaching his or her full development.

We are seeing an increase in hypospadias in boys. Hypospadia is a condition where the urethra doesn't come out at the end of the penis. This particular developmental process starts on day 56 in the womb and ends on day 84. Hypospadia has nothing to do with genetic pre-disposition. But what can cause this condition is dioxin and DDT. And it is not just this type of hypospadias that is increasing but also the more severe form, where the end of the urethra actually comes out of the scrotum. It is almost impossible to repair this surgically.

Hypospadias and undescended testicles – another condition that results from males not fully developing in the womb – put young men at greater risk of developing testicular cancer, which is one of the fastest-growing cancers in the world, and is occuring in younger and younger men.

Finally, males with hypospadias and undescended testicles always produce less sperm, which means they are more likely to have reproductive problems...

During embryonic and foetal development, the brain isn't developed yet, so you have got an individual that has no feedback mechanism to protect itself. The foetus is still growing new tissue, constructing its nervous system, constructing elements of its immune system and the reproductive tract. When all your organs are formed and fully functioning, it takes a lot more to blow them away.

But we are never going to be able to prove a causal relationship of anything in a human being because we can't feed chemicals to human beings and wait for them to grow up.

In the case of a developmental problem such as attention deficit hyperactivity syndrome (ADHD) in children, for example (this is in answer to the interviewer's question on ADHD—ed.), it is very difficult (to prove a causal relationship) because the syndrome is probably precipitated pre-natally or in early infancy through something that interfered with the development of the brain. And the presence of the chemical in that individual later on in life may not indicate that it was the cause.

Despite the fact that there are a lot of misdiagnosed kids, I still think ADHD is on the increase. And the evidence is almost overwhelming that these chemicals are involved."

Common Pesticides as Endocrine Disruptors

Endocrine-disrupting pesticides vary in their effects since they may involve different receptors and target cells, accumulate at different rates, and have different binding affinities. Consider, for example, vinclozolin, a commonly used fungicide (which has been shown to strongly block the receptors for the male hormone androgen when given to pregnant rats)[1]. When vinclozolin was present during critical periods of foetal development, genital malformations were common and these would affect reproduction later in life. Scientists had difficulty identifying the male offspring at birth because they had genitals that were feminized: i.e., undescended testes, vaginal pouches, reduced seminal vesicles and prostate glands and cleft phalli. The vinclozolin molecule itself is not the culprit but it is broken down in the body into two products which are endocrine disruptors. This provides a classical example of the body's natural chemical detoxification system producing more dangerous chemicals.

Another example is the old DDT. Concerns about the effects of DDT and its metabolites on the health of wildlife and humans have a long history. A variety of abnormalities seen in male sexual development have been linked to DDT. It was earlier thought that these effects (as also the well-documented eggshell thinning) were in part due to DDT's interference with estrogen receptors but recently it has been shown that the primary metabolite (breakdown product) of DDT, p,p'-DDE, blocks androgen receptors. Like vinclozolin, it also binds to the androgen receptor, blocking a switch critical for the development of normal males.[2]

Eggshell thinning is another effect seen in birds exposed to DDT. Scientists had long suspected that this was the result of estrogen-mimicking. However, recent work reveals that the effect is also instigated by DDE which acts to inhibit the production of another hormone, called prostaglandins, which are critical to calcium balance and deposition of calcium in eggshells. This is a very important example that endocrine disruption does not only occur through the receptors that hormones usually signal cells in the body. Many hormones have other specialized ways of communicating other messages that are critical for many other processes.

These are only two examples of endocrine-disrupting behaviours of commonly used pesticides.

Other Offending Pesticides

Herbicides:
2,4,-D
2,4,5,-T
Alachlor
Amitrole
Atrazine
Metribuzin
Nitrofen
Trifluralin

Fungicides:
Benomyl
Ethylene thiourea
Fenarimol
Hexachlorobenzene
Mancozeb
Maneb
Metiram-complex
Tri-butyl-lin
Zineb
Ziram

Insecticides:
beta-HCH
Carbaryl
Chlordane
Chlordecone
Dicofol
Dieldrin
Endosulfan
Heptachlor / H-epoxide
Lindane (gamma-HCH)
Malathion
Methomyl
Methoxychlor
Oxychlordane
Parathion
Synthetic pyrethroids
Transnonachlor
Toxaphene

Nematocides:
Aldicarb
DBCP

References:
1. Gray Jr, L.E., J.S. Ostby and W.R. Kelce, 1994, Developmental effects of an environmental antiandrogen: the fungicide vinclozolin alters sex differentiation of the male rat, Toxicology and Applied Pharmacology, 129: 46-52.
2. Kelce W.R., C.R. Stone, S.C. Laws, L.E. Gray, J. A. Kemppainen and E. M. Wilson , 1995, Persistent DDT metabolite p,p'-DDE is a potent androgen receptor antagonist, Nature, 375:581-585.

Source: Dr. Michael Smolen, World Wildlife Fund, USA.

DDT Can Reduce Breast Milk

Besides the numerous health effects of DDT, the presence of DDT and DDE (a breakdown product of DDT) in breast milk can lead to a decrease in breast milk and shorten the period of lactation, according to some studies. This is significant in that breast milk is the main source of healthy food and nutrition for infants in developing countries, and it is in these countries that DDT is still being heavily used.

Studies of the implications of DDT and DDE in mothers' milk done in Mexico and the U.S. have shown that higher levels of DDE in breast milk are associated with shorter periods of lactation. [1] A fall in estrogen levels partly leads to lactation after child birth, but the presence of estrogen mimics like DDT or DDE in these mothers inhibits full lactation, it is said.

But whether it is as a source of contamination of breastmilk, or as a cause of a reduction in breastmilk and shortening of the period of lactation, it is clear that it is the use of pesticides that need to stop, and not the act of breastfeeding itself. Very often contamination and problems with breastmilk are used as a deterrent to women who want to breastfeed their babies. Breastfeeding is very important to the wellbeing and nutrition of the baby.

Source: Global Pesticide Campaigner, September 1998; and additional comments on breastfeeding from the International Baby Food Action Network, November,1999.

Reference:

1. Gladen, B.C., W.J. Rogan, 1995, "DDE and shortened duration of lactation in a northern Mexican town", American Journal of Public Health, 85 (4). Rogan W.J., B.C. Gladen, et al, 1987, "PCBs and DDE in human milk: effects on growth morbidity and duration of lactation", American Journal of Public Health, 77(10).

effects on its health later in life.

For example, changes in the developing brain can alter neural pathways leading to altered adult behaviour or alter the functions of many endocrine systems. ***(See also Article: Pesticides and Aggression, in page 37).*** Changes to the thymus and bone marrow cells can lead to immune suppression. Changes to the testis or ovary can reduce sperm or egg quality and quantity.

Scientists studying cancer are also concerned that subtle changes in early development can predispose individuals to certain types of cancer later in life, such as prostate or breast cancers. Therefore, the presence of endocrine disrupting chemicals is particularly serious in pregnant or nursing women, and in developing foetuses or infants. ***(See also Article: Pesticides, Organochlorines and Breast Cancer, in this Section).***

We must therefore assess to what extent pesticides are involved in endocrine disruption, specially those pesticides which are produced in large quantities, widely dispersed and frequently transported over long distances over water or through the air. Many pesticides and other synthetic chemicals do not degrade and persist in the environment. Some breakdown in the body into different chemicals that are more biologically active, and interfere with the function of the normal endocrine systems. Many can accumulate in the fat of animals and are passed through the predator-prey food chain.

Preliminary studies have identified pesticides such as endosulfan, methoxychlor, dicofol, lindane, DDT and its metabolites, vinclozolin, chlordecone, toxaphene, 2,4-D, 2,4,5-T, atrazine, carbaryl, dieldrin, heptachlor, mirex, malathion and chlordane as endocrine-disruptors. There is no battery of tests yet available that can ascertain that specific chemicals are either endocrine-disruptors or are safe. Such screening tests are currently being evaluated but until such tests become available, every chemical, especially pesticides, must be considered potentially disruptive.

Exposure to commonly used pesticides is not restricted only to applicators but consumers too. Vinclozolin residues for instance, can be found in many foods, including beans, peas, and onions [9]. DDE (a breakdown product of DDT) may be a more serious concern since it dissolves in body fat, resists degradation, persists in the body for decades and, transferring through the food chain, gets concentrated to high levels in fish, wildlife and humans worldwide. Even when dietary or occupational exposures to the chemical are low on a daily basis, the concentrations in body tissues increase over the years, and by the time a female reaches reproductive age, the concentrations of chemicals such as p,p'-DDE can be substantial. ***(See Box: Common Pesticides as Endocrine Disruptors).***

A Sensitive Target

As mentioned earlier, the developing offspring is the most sensitive target of endocrine disruption. Many man-made chemicals can cross the placental barrier in the womb and diffuse from the mother's body into the developing offspring. Further, fat-loving chemicals lodged in the fat-rich breast milk are passed on to suckling infants. Thus the exposure to concentrated doses of these chemicals in the womb and in early childhood can be

the highest. This is a matter of much concern. This is because much of the development of the nervous, reproductive and immune systems continues long after birth, and exposure to chemicals such as DDT and its metabolites in the early phase of life can have a wide range of effects on this development. Besides the well-known consequences, there may be other, more cryptic, effects arising from a soup of endocrine disruptors. It has been, for example, reported [10] that higher levels of DDE in women shortens the period of lactation; DDE as a contributing factor in lactation failure is a phenomenon that is being noticed throughout the world. ***(See Box: DDT Can Reduce Breast Milk).***

What Should We Do?

We must begin by recognizing that man-made chemicals have the potential to disrupt the natural endocrine systems of animals, and because the endocrine system is interwoven throughout the life of every animal, effects may vary in site and severity. Disturbances instigated in the developing offspring may not be seen until adulthood, far removed from the early endocrine disruption. Likewise, we cannot assume that processes common to insects, fish, shellfish, amphibians, reptiles, birds and mammals are different from the cellular and molecular processes in humans.

We must realize that we are literally awash in man-made chemicals that have not been rigorously tested for their ability to disrupt endocrine systems, and that we can no longer afford to assume that they are inert baggage that we acquire through life. We must assume that man-made chemicals can be endocrine disruptors, and until tests are implemented to screen and test these chemicals, we must be prudent and adopt the precautionary actions necessary to safeguard our survival.

Dr. Michael Smolen of the World Wildlife Fund (WWF) U.S; is part of the team of scientists who have undertaken extensive work and research on environmental contaminants, a major part of which include pesticides, their impacts – particularly on the human endocrine system – and the serious human health and environmental implications of exposure to such contaminants.

References:

1. Davis D.L., A. Blair and D. Hoel, 1992, 'Agricultural Exposures and Cancer Trends in Developed Countries', Environmental Health Perspectives, 100:39-44.

2. Giwercman A., E. Carlsen, N. Keiding, and N.E. Skakkebaek, 1993, 'Evidence for increasing incidence of abnormalities of the human testis: A review'm, Environmental Health Perspectives 101, (Supplement 2):65-71.

3. Carlsen, E., A. Giwercman, N. Keiding and N.E. Skakkebaek, 1995, 'Declining semen quality and increasing incidence of testicular cancer: Is there a common cause?', Environmental Health Perspectives, 103(Supplement 7):137-139.

4. Auger, J., J.M. Kunstmann, F. Czyglik, P. Jouannet, 1995, 'Decline in semen quality among fertile men in Paris during the past 20 years', New England Journal of Medicine, 332(2):281-285.

5. Colborn T., 1995, 'Pesticides - How research has succeeded and failed to translate science into policy: Endocrinological effects on wildlife', Environmental Health Perspectives, 103(Supplement 6):81-85.

6. Bern, H.A., 1992, 'Diethylstilbestrol (DES) syndrome: present status of animal and human studies', in: Hormonal Carcinogenesis, (J. Li, S. Nandi, and S.A. Li, eds.), Springer-Verlag, New York, 392p.

7. Colborn, T. and C. Clement, 1992, 'Chemically-induced alterations in sexual and functional development: The wildlife/human connection', Princeton Scientific Publishing, Princeton, New Jersey.

8. Bern, H., 1992, "The fragile fetus". in: 'Chemically-induced alterations in sexual and functional development: The wildlife/human connection', (Colborn, T. and C. Clement, eds.), Princeton Scientific Publishing, Princeton, New Jersey.

9. The Pesticide Register, 1991, Joint publication of MAFF and HSE, Issue 3, March 1991. London.

10. Gladen B.C. and W.J. Rogan, 1995, "DDE and shortened duration of lactation in a northern Mexican town", American Journal of Public Health, 85(4):504-508.

Pesticides and Aggression?

A group of biologists and medical researchers at the University of Wisconsin in Madison, led by Warren P. Porter, have this year completed a 5-year experiment putting mixtures of low levels of these chemicals into the drinking water of male mice and carefully measuring the results. They reported that combinations of these chemicals — at levels similar to those found in the groundwater of agricultural areas of the U.S. — have measurable detrimental effects on the nervous, immune and endocrine (hormone) systems. [1] Furthermore, they say their research has direct implications for humans.

Dr. Porter and his colleagues point out that the nervous system, the immune system, and the endocrine (hormone) system are all closely related and in constant communication with each other. If any one of the three systems is damaged or degraded the other two may be adversely affected. The Wisconsin researchers therefore designed their experiments to examine the effects of agricultural chemicals on each of the three systems simultaneously. To assess immune system function, they measured the ability of mice to make antibodies in response to foreign proteins. To assess endocrine system function, they measured thyroid hormone levels in the blood. And to assess nervous system function they measured aggressive behaviour in the presence of intruder mice introduced into the cages. They also looked for effects on growth by measuring total body weight and the weight of each animal's spleen.

The experiments were replicated many times, to make sure the results were reproducible. They found effects on the endocrine system (thyroid hormone levels) and the immune system, and reduced body weight, from mixtures of low levels of aldicarb and nitrate, atrazine and nitrate, and atrazine, aldicarb and nitrate together. They observed increased aggression from exposure to atrazine and nitrate, and from atrazine, aldicarb and nitrate together.

The Wisconsin research team wrote, "Of particular signficance in the collective work of Boyd and others, [2] Porter and others, [3] and our current study [1] is that THYROID HORMONE CONCENTRATION CHANGE was consistently a response due to mixtures, but NOT usually to individual chemicals." [Emphasis in the original].

In the five-year experiment, thyroid hormone levels rose or fell depending upon the mixture of farm chemicals put into the drinking water. Dr. Porter and his colleagues present evidence from other studies showing that numerous farm chemicals can affect the thyroid hormone levels of wildlife and humans. PCBs and dioxins can have similar effects, they note. Proper levels of thyroid hormone are essential for brain development of humans prior to birth. Some, though not all, studies have shown that attention deficit and/or hyperactivity disorders in children are linked to changes in the levels of thyroid hormone in the blood. Children with multiple chemical sensitivity (MCS) have abnormal thyroid levels. Furthermore, irritability and aggressive behavior are linked to thyroid hormone levels.

Dr. Porter explained [4], "Earlier work had shown that thyroid hormone typically changed when exposure to these pesticides occurred. Thyroid hormone not only affects and controls your metabolic rate, that is, how fast you burn food, it also controls your irritability level. For example, Type A personalities are more assertive, more aggressive, more hyper. These people tend to have higher levels of thyroid hormone. Type B personalities—people that are really laid back, really take things very easily—have lower levels of thyroid hormone. We expected that changes in thyroid [would] change irritability levels. This was a concern because there was information that kids are getting more hyper and [that their] learning abilities are going down," Dr. Porter said.

Source: Extract from Rachel's Environment & Health Weekly #648 - Pesticides and Aggression, by Peter Montague, April 29, 1999.

References:

[1] Warren P. Porter, James W. Jaeger and Ian H. Carlson, "Endocrine, immune and behavioral effects of aldicarb (carbamate), atrazine (triazine) and nitrate (fertilizer) mixtures at groundwater concentrations," TOXICOLOGY AND INDUSTRIAL HEALTH Vol. 15, Nos. 1 and 2 (1999), pgs. 133-150.

[2] C.A. Boyd, M.H. Weiler and W.P. Porter, "Behavioral and neurochemical changes associated with chronic exposure to low-level concentration of pesticide mixtures," JOURNAL OF TOXICOLOGY AND ENVIRONMENTAL HEALTH Vol. 30, No. 3 (July 1990), pgs. 209-221.

[3] W.P. Porter and others, "Groundwater pesticides: interactive effects of low concentrations of carbamates aldicarb and methamyl and the triazine metribuzin on thyroxine and somatotropin levels in white rats," JOURNAL OF TOXICOLOGY AND ENVIRONMENTAL HEALTH Vol. 40, No. 1 (September 1993), pgs. 15-34. And see: W.P. Porter and others, "Toxicant-disease-environment interactions associated with suppression of immune system, growth, and reproduction," SCIENCE Vol. 224, No. 4652 (June 1, 1984), pgs. 1014-1017.

[4] Interview with Keith Hamm, "What's In the Mix?" SANTA BARBARA [CALIFORNIA] INDEPENDENT

Rachel's Environment & Health Weekly is a publication of the Environmental Research Foundation (ERF). For more information contact ERF at P.O. Box 5036, Annapolis, MD 21403. Fax (410) 263-8944; Internet: erf@rachel.org.

Table of other Known and Suspected Endocrine Disrupters and Their Uses

ORGANOHALOGENS

Dioxins - *Unintentionally produced by-products of processes in which chlorine and chlorine derived chemicals are produced, used and disposed of. Combustion processes such as waste incineration are a major source.*

Several Polychlorinated biphenyls (PCBs) - *Now banned world-wide, but still found in old electrical equipment. Due to persistence they still ubiquitous in the environment. Inputs into the environment continue from waste dump leakage.*

Perchloroethylene (PERC) - *The main solvent used in dry-cleaning. Water-based alternatives to dry-cleaning are now available.*

Halogenated phenols:

Pentachlorophenol (PCP) - Used as a wood preservative and in textiles. Now banned in some European countries.

Polybrominated bisphenol-A - Widely used as a flame retardant in plastics.

4-Cl-3-methylphenol - Used in cosmetic products.

4-Cl-2-methylphenol - Used as an additive in pesticides.

PLASTICS

Phthalate plasticisers: eg. benzylbutylphthalate (BBP), di-n-butylphthalate (DBP)

Used in PVC, polyvinyl acetate, poly-urethane and some polystyrene plastics. About 90% used in the manufacture of PVC to make numerous products e.g. flooring, water pipes, cables, furniture, children's toys, pharmaceutical packaging including blood bags. Phthalates are also used in non-plastic applications e.g. Paints, pesticides, inks, hairspray and insect repellents.

INDUSTRIAL CHEMICALS

Alkylphenolic chemicals: several including 4-nonylphenol, 4-tert-octylphenol - *Breakdown products of industrial alkylphenol ethoxylate detergents and pesticide additives. Also used in paint, textiles, metal finishing, certain plastics and lubricating* oils.

Bisphenol-A - *Main uses in polycarbonate plastics and epoxy resins. Also for coating thermosensitive paper, stabiliser for PVC softeners, tyre production.*

***t*-Butylhydroxyanisole (BHA)** - *Used as an antioxidant, especially in foods.*

Lead - *Main use is in batteries. Also used in the production of chemicals, petrol additives, various metal products and ammunition.*

Methylmercury (organic form of mercury) - *Mercury uses include electrical equipment, batteries, production of chlorine gas. It is a by-product of gold mining. Several uses eg. in fungicides have declined in past 20 years.*

Cadmium - *Main uses for batteries and metal plating, also for pigments, plastics and synthetics.*

Styrenes - *Used to produce polystyrene; also released from some polystyrene applications.*

Certain polyaromatic hydrocarbons - *Formed in combustion processes e.g. burning fossil fuels. Ubiquitous in the environment and food.*

Dimethyl formamide (DMFA) - *Common industrial and laboratory solvent. Used in the production of synthetic leather products.*

Ethylene glycol - *Common industrial and laboratory solvent. Used in the production of polymers for fabrics, and even in food products.*

Source: "POISONING THE FUTURE, Impacts of Endocrine-Disrupting Chemicals on Wildlife and Human Health", Greenpeace, October 1997. See Greenpeace Website Original Adaptation from from Colborn et al.1993, Jobling and Sumpter 1993, White et al. 1994, Bradlow et al. 1995, Jobling et al.1995 and 1996, Kime 1995, Soto et al. 1995, Toppari et al. 1995, Lyons 1996, Ren et al. 1996, Korner et al. 1997 and personal communication, Moore and Waring (1997), Santodonato 1997.

Endocrine Disruptors are in Our Foods, Food Containers and Consumer Products

by K. Prabhakar Nair

As has been established else where in this book, residues of endocrine disruptor pesticides can be found in many foods such as fruits and vegetables. For example, vinclozolin, a common fungicide and a known endocrine disruptor, and can be found in beans, peas, onions, cherries and other fruits.

The Plague of Industrial Chemicals

But besides pesticides, there are a range of industrial chemicals which are endocrine disruptors, and some of these are used in household products of daily use, including food containers and food can linings, baby feeding bottles, plastics, plastic toys and teething rings, plastic dental sealants, etc.

Among these chemicals are bisphenol-A which is used in making polycarbonate plastics –the vary materials used in baby feeding bottles, water jugs, soup bowls, etc; and in metal food can linings. PCBs (polychlorinated biphenyls) are used in a range of industrial applications for example as electrical insulators in electrical power products, as lubricants and paint additives, in plasticizers in making plastics, etc. And phthalates, used as plasticizers and in cosmetics, etc. The table here lists the endocrine-disrupting industrial chemicals.

The Persistent of PCBs

PCBs, which are highly persistent, can travel thousands of miles in the atmosphere, get deposited in water bodies and contaminate fish, animals and humans through the food chain. They have been found in the bodies of creatures very deep underwater as well as in remote-dwellers such as the Arctic polar bears. The adverse health effects among children, whose mothers had eaten PCB-contaminated fish from the chemically polluted Great Lakes group, in North America for at least six years before pregnancy, are in fact the subject of an important ongoing study. Long-term studies of the more exposed (in the womb) among these children by Drs. Joseph and Sandra Jacobson at the Wayne State University in the U.S. have shown that they had attention and learning problems, had poorer memory and were likely to have lower IQs. Another such study, at the State University of New York, also showed "neurobehavioural

Table: Consumer Products with Endocrine Disruptors

Bisphenol-A: Used in polycarbonate plastics which are used for making baby feeding bottles, water jugs, soup bowls, plastic dental sealants and in metal food can linings, etc.

Styrene: Used in plastic cups and food containers, etc

Phthalates: Used in the making of cosmetics, etc

Butylhydroxyanisol (BHA): Used in the making of cosmetics, etc cosmetics)

PCBs (polychlorinated biphenyls): Used in a range of industrial applications, particularly electrical equipment such as transformers and released into the environment while dismantling them or during accidents. Its use has been discontinued or restricted in several industrial countries, but continues to be used in some Asian countries.

deficits", and also intolerance to stress and abnormal reflexes, among another group of such children exposed in the womb to chemical contaminants from fish eaten by their mothers.

"The collective weight of the evidence indicates that certain PCB/dioxin-like compounds found in fish...can cause neurobehavioural deficits", according to the agency for Toxic Substances and Disease Registry of the U.S. Public Health Service. "Further, the evidence indicates that these compounds have produced some effects in some Great Lakes fish consumers." Another study has shown that PCBs interfere with the thyroid hormones, which also indicates why these chemicals are associated with attention and learning problems in exposed children.

Meanwhile, recent research has increased concern about hormone-disrupting chemicals that leach out from plastic products that are widely used and pose a health hazard even at tiny doses. Researchers at the University of Missouri, USA, exposed mouse foetuses to bisphenol-A at 2 parts per billion and found that the male mice born had enlarged prostate glands; higher doses lead to a decrease in sperm production.

"However, although animal studies have raised worrisome questions about contaminants in food, plastic containers and other consumer products, surprisingly little testing has been done on substances encountered in daily life. Product testing for contaminants deserves to be a much higher research priority", says a paper by the World Wildlife Fund, which has been following these studies.

Protecting Our Babies

A few tests, though, have been done. "In Europe, several national governments have tested children's plastic teething rings and toys and found that some were indeed leaching hormonally active chemicals. In several countries, these toys and teething rings have been removed from the market. Elsewhere, independent consumer groups have filled in the breach. In the U.S., the Consumers Union recently tested baby foods for dioxins, PCBs and related compounds and also tested seven brands of plastic food wraps for adipates and phthalates, two groups of chemicals used as plasticizers (in manufacturing plastics and other products) that affect development and reproduction. A Japanese consumer group has also done its own testing of six brands of plastic baby bottles."

Japanese studies have shown that plastic feeding bottles made of polycarbonate contain bisphenol-A, an endocrine-disrupting chemical. The studies, done last year, by the Prefectural University of Kumamato and the University of Nagasaki found that bisphenol-A leached out of new polycarbonate baby feeding bottles at 1 to 3 parts per billion; it was higher in used, worn or scratched bottles.

Similar results were also reported more recently by the Consumer Union in the US, which tested polycarbonate feeding bottles and found that they leached bisphenol-A. The Consumer Union's journal, "Consumer Reports", in its May 1999 issue, said: "Babies who used the bottles we tested could be exposed to a bisphenol-A dose 40 times higher than...a conservative definition of safety", which, for infants, would be as low as 0.1 percent of the level which causes harmful effects in animals.

"Therefore, at the very least, consumers should have information about which plastics leach possibly hormonally active compounds, so they can avoid exposure to them if they choose," says the paper.

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Source: Article based on information gathered from 'Chemicals that compromise life,' World Wildlife Fund (WWF), 1998; 'Feeding Poison?', Utusan Konsumer, Consumer Association of Penang (CAP), August 1999; 'Endocrine disruptors threaten our offspring', Japan Offspring Fund Safety Check List; and Consumer Reports, USA, May 1999.

Endocrine Disruptors – Time for Action?

by Peter Montague

After four years of study, the National Research Council (NRC) of the National Academy of Sciences on August 4,1999 published its report on hormone-disrupting chemicals in the environment.[1] The report represents a consensus statement by the NRC's Committee on Hormonally Active Agents in the Environment: a committee made up of 16 scientists,[2] including some who are closely aligned with the chemical industry.

The Committee had been asked by Congress and by the U.S. Environmental Protection Agency (EPA) to evaluate the hazards posed by hormone-disrupting chemicals in the environment. Dozens, perhaps hundreds, of common industrial chemicals are known to interfere with hormones under some conditions, so the stakes are high.

Hormones are naturally-occurring chemicals that circulate at very low levels in the blood stream of all vertebrate animals including reptiles, amphibians, fish, birds and mammals. In all vertebrate species, hormones act as chemical messengers and as switches, turning on and off bodily systems that control growth, development, learning and behaviour. Hormones control growth and development prior to birth or hatching, and hormones continue to influence behaviour throughout life. Hormones profoundly affect the nervous system, the reproductive system, and the immune system. [1, pg.197]

Because of the importance of hormones in the life of all vertebrates, industrial chemicals that can interfere with hormones are exceedingly important from a public health perspective. They also cause represent major embarrassments and liabilities for the corporations that put such chemicals into common use without adequate safety tests. The presence of synthetic hormone-disrupting chemicals in air, water, sediments, soil and food also represents a major failure of the U.S. Public Health Service and the U.S. Environmental Protection Agency.

Furthermore, if hormone-disrupting chemicals in the environment are identified as an important problem, then someone may be held responsible (at least in the court of public opinion) and confidence in government and in the chemical industry may drop below their present 'subterranean' levels. Therefore, there is powerful pressure from many parts of "the Establishment" to deny the existence of this problem.

What the Report Said

Despite the highly-charged nature of the subject, and despite the presence of chemical industry representatives on the committee, the NRC's consensus report is rather strong, as indicated by these verbatim quotations:

"Adverse reproductive and developmental effects have been observed in human populations, wildlife, and laboratory animals as a consequence of exposure to HAAs [hormonally active agents]." [1,pg.3]

"Most notable are the adverse reproductive and developmental effects that have been observed in birds such as cormorants, herrings gulls, Caspian terns, and bald eagles that feed on contaminated fish, which have led to drastically lowered reproductive success and population declines." [1,pg.9]

"Laboratory studies using male and female rats, mice, and guinea pigs, and female rhesus monkeys have shown that exposure of these animals during development to a variety of concentrations of certain HAAs (e.g., DDT, methoxychlor, polychlorinated biphenyls or PCBs, dioxin, bisphenol A, octylphenol, butyl benzyl phthalate (BBP), dibutyl phthalate (DBP), chlordecone, and vinclozolin), can produce structural and functional abnormalities of the reproductive tract." [1,pg.3]

"There is evidence of suppression of the immune system by exposure to organochlorines (predominantly PCBs) in birds in the Great Lakes region. There is also evidence of suppression of innate and acquired immune responses in seals fed fish from the PCB-contaminated Baltic Sea. Such immunosuppression is believed to be the reason for the increased incidences of bacterial and viral infections in seals in similarly contaminated waters." [1,pg.5]

"Environmental HAAs [hormonally active agents] probably have contributed to declines in some wildlife populations, including fish and birds of the Great Lakes and juvenile alligators of Lake Apopka [in Florida], and possibly to diseases and deformities in mink in the United States, river otters in Europe, and marine mammals in European waters." [1,pg.6]

"Synthetic HAAs [i.e., HAAs released by chemical corporations] have been detected in all environmental media [air, water, sediments, and soil], although concentrations of some compounds, such as PCBs and DDT, have declined in some regions, because their use has been discontinued in those countries. However, those HAAs and others can persist in some media, such as sediments, for years and can contaminate areas far removed from the original site of contamination (e.g., via atmospheric transport)." [1,pg.7]

The Human Impact

"Human dietary intake of synthetic HAAs remains substantial, even intake of HAAs that have not been used commercially for many years. For example, a recent survey of the U.S. diet found detectable residues of DDT in 16 per cent of the food samples. Human exposure is further demonstrated by concentrations of DDT in the adipose (fatty) tissue. Over 95 per cent of adipose tissue samples taken from the U.S. population contained detectable concentrations of some HAA. Although the concentrations were found to be greatest in older individuals, even children were not immune from exposure." [1,pg.76]

"Concentrations of HAAs and other xenobiotics [chemicals foreign to the body] have been measured in milk from humans around the globe." [1,pg.82]

"In the Michigan/Maternal Infant Cohort Study, Fein et al. (1984) evaluated the birth size and gestational age of 242 infants and found that maternal consumption of fish and concentrations of PCBs in cord serum [in blood in the umbilical cord] were correlated with lowered birth weight, shortened gestation [time in the womb], and smaller head circumference. Lower weight was also observed in children from this cohort at 4 yr [years] in a dose-dependent fashion (Jacobson et al. 1990). Children with cord serum PCB levels of 5.0 ng/mL [nanograms per milliliter] or more weighed 1.8 kg [4 pounds] less on average than the lowest exposed children. Prenatal exposure was also associated with deficits in neurologic development in followup studies of these children at up to 11 yr [years]." [1,pg.125]

"Elevated levels of the herbicide atrazine found in municipal water supplies in Iowa were associated with excess rates of cardiovascular, urogenital, and limb-reduction deficits [birth defects]." [1,pg.130]

"Studies with laboratory animals have shown that prenatal exposure to some HAAs, such as methoxychlor, TCDD [dioxin], and octylphenol and bisphenol A can reduce sperm production." [1,pg.131]

"A neurologic assessment of an aging population of Great Lakes fisheaters is currently being conducted by Schantz et al. (1996). In all, 104 fisheaters and 84 nonfisheaters, age 50 or older, were enrolled in the study.... the fisheaters performed more poorly on tests requiring cognitive flexibility, word naming, auditory recall, and more complex motor task [sic] compared with individuals who do not eat fish." [1,pg.173]

"Long-term epidemiologic studies of cognitive and neurobehavioural development have been conducted in Michigan, New York, North Carolina, and the Netherlands on children exposed pre- and postnatally to PCBs from maternal consumption of contaminated fish or other food products. Studies of cognitive development (i.e., short-term memory, visual discrimination, and IQ scores) in Michigan show consistent correlations between prenatal exposure to PCBs and deficits at up to 11 yr [years]. Similarly, in the Netherlands, lower cognitive scores were associated with prenatal exposure when tested in 3-5-yr-old children." [1,pg.174]

"Taken together, the results of animal and human studies indicate that prenatal exposure to PCBs can affect neurologic development." [1,pg.175]

"It has been well documented that HAHs [halogenated aromatic hydrocarbons] such as TCDD [dioxin], polychlorinated dibenzofurans (PCDFs), and PCBs, affect immune response, and they appear to affect all functional arms of the immune system (innate immunity and host resistance, cell-mediated immunity, and humoral immunity)." [1,pg.178]

"There have only been a few studies of the effects of HAAs [hormonally active agents] in humans, but the results of laboratory and wildlife studies suggest that HAAs have the potential to affect human immune functions." [1,pg.194]

We Need Action Now

The NRC report concludes that, at present the 70,000 industrial chemicals already in use cannot be tested to see if they are hormone-disruptors or not, because the necessary tests do not exist. [1,pg.414] Meanwhile between 1000 and 2000 new inadequately tested chemicals are being put into commercial use each year.

Therefore, adequate knowledge of hormone-disrupting chemicals lies many decades in the future, a kind of scientific holy grail. What is not known about hormone disrupting chemicals is considerably larger than what is known, and will remain so for a long time to come.

Yet the NRC report has amply documented, from studies of wildlife, laboratory animals, and humans, that many industrial chemicals (at levels already present in the environment) are currently interfering with hormones. These chemicals cause problems in reproduction and development, the nervous system (including diminished IQ and learning ability), and the immune system which protects us all from bacteria, viruses and cancers. The harm is happening now!

Erring on the Side of Precaution

Thus hormone-disrupting chemicals meet the two tests established by the precautionary principle: scientific uncertainty, and a reasonable suspicion of harm.

Therefore while scientific study continues, decision-makers have a duty to take precautionary action to prevent further harm even though scientific certainty has not been established. As a signatory to the Rio Declaration of 1992, the U.S. is legally obligated to take precautionary action. The government will only respond if popular pressure is sufficient to offset inertia, the forces of denial, and influence from the chemical industry.

Building that pressure is up to us!

Source: Edited extract from Rachel's Environment & Health Weekly #655, 'Cause for Precautionary Action' by Peter Montague, August 26, 1999.

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[1] Ernst Knobil and others, HORMONALLY ACTIVE AGENTS IN THE ENVIRONMENT (Washington, D.C.: National Academy Press, July 1999). ISBN 0-309-06419-8.

[2] Members of the NRC Committee on Hormonally Active Agents in the Environment included: Ernst Knobil (chair), The University of Texas-Houston Medical School, Houston, Tex.; Howard A. Bern, University of California, Berkeley, Cal.; Joanna Burger, Rutgers University, Piscataway, N.J.; D. Michael Fry, University of California, Davis, Calif.; John P. Giesy, Michigan State University, East Lansing, Mich.; Jack Gorski, University of Wisconsin, Madison, Wis.; Charles J. Grossman, Department of Veterans Affairs Medical Center, Cincinnati, Ohio and Xavier University, Cincinnati, Ohio; Louis J. Guillette, Jr., University of Florida, Gainesville, Fla.; Barbara S. Hulka, University of North Carolina, Chapel Hill, N.C.; James C. Lamb IV, Jellinek, Schwartz & Connolly, Arlington, Va.; Leslie A. Real, Emory University, Atlanta, Ga.; Stephen M. Safe, Texas A&M University, College Station, Tex.; Ana M. Soto, Tufts University, Boston, Mass.; John J. Stegeman, Woods Hole Oceanographic Institution, Woods Hole, Mass.; Shanna Helen Swann, University of Missouri, Columbia, Mo.; Frederick S. vom Saal, University of Missouri, Columbia, Mo.

Rachel's Environment & Health Weekly is a publication of the Environmental Research Foundation (ERF). For more information contact ERF at P.O. Box 5036, Annapolis, MD 21403. Fax (410) 263-8944; Internet: erf@rachel.org.

Pesticides, Organochlorines and Breast Cancer

The Problem

Breast cancer has been linked to pesticides and persistant organochlorine chemicals in recent investigations. This class of substances, called "xenoestrogens" by researchers such as Devra Davis and Leon Bradlow, have been found to be problematic because they mimic the body's natural estrogen. [1]

The pesticide DDT and its major metabolite DDE has been most commonly linked to breast cancer, but other organochlorine substances of concern include benzene hexachloride (BHC or lindane as well as halogenated biphenyls, polychlorinated biphenyls (PCBs) and polybrominated biphenyls (PBBs). Studies have found organochlorine substances accumulating in human tissues, blood, fat and breast milk. DDT, though banned in the United States since 1972, still is used in many parts of the world and persists in soils, lake sediments, human fat and the food chain.

Other pesticide formulas still in use such as dicofol, chlorothalonil, Dacthal and PCNB, contain banned pesticide substances. Pesticides currently used but which are associated with mammary tumors in animals that are not estrogen mimickers include the herbicides atrazine, cyanazine and ethafluralin.

The Mounting Evidence

In October 1993, the Health and Environment subcommittee of the U.S. House of Representatives Energy and Commerce Committee heard testimony about a range of pesticides that may have estrogenic effects. Ana Soto, Professor of the Department of Anatomy and Cellular Biology at Tufts University, testified that endosulfan has estrogenic properties comparable to those of DDT. Endosulfan has been identified as the seventh most commonly detected pesticide residue in food samples taken by the U.S. FDA between 1986 and 1991.

Evidence substantiating links between pesticides, other organochlorines and breast cancer began in the 1970s. Research by Wasserman and others on a small number of women in the 1970's found higher levels of DDT and PCBs in those with breast cancer than in healthy women. [2] In Helsinki, Finland researchers comparing women with breast cancer with cancer free women found significantly higher levels of a metabolite of the pesticide beta hexachlorocyclohexane B-HCH in women with breast cancer.[3] This group not find statistically significant differences between breast cancer patients and controls in levels of DDT, DDE or PCB's. A more recent pilot study by Falck found that concentrations of PCB's and DDE were 50 to 60 per cent higher in tissues of 20 women with breast cancer than in controls. [4]

Some of the largest studies on organochiorines and breast cancer were done New York City between 1985 and 1991, testing the amount of pesticides such as DDT and substances such as PCBs in the blood of over 14,000 women. The University Women's Health Study found significantly higher levels of these pesticides in breast cancer patients, than in women without cancer. Women with the highest levels of DDE were found to have a four-fold increased risk compared to those with the lowest levels. [5-7]

One of the largest studies to date by Kreiger in San Francisco analyzed amounts, of DDE and PCBs in blood samples from 50 Caucasian, 50 African-American and 50 Asian-American women. Relative risks for DDE levels were higher in Caucasian and African-American women with breast cancer, but not in Asian women but these trends were not found to be statistically significant. [8] A Finnish study did not find that levels of DDE and PCB's were associated with breast cancer risk but did re-

Pesticides and Cancer
Table of Currently Used Pesticides Of Concern

Name	Use	Comments
Atrazine	Corn, sorghum production. Most heavily used pesticide in the U.S.	Caused benign and malignant mammary gland tumours in female rats.
Cyanazine	Herbicide used mostly on corn. Among top five in U.S. Agreement with EPA to end U.S. production by December 1999.	Caused significant mammary gland tumors in female rats.
Dichlorvos	Insecticide used as fumigant in greenhouses, fruit and vegetable crops, livestock. Used to make pet flea collars Pest strips	Caused an increase in mammary gland tumours in female rats.
Endosulfan	Insecticide used on wide variety of fiber, fruit, and vegetables.	Estrogenic in lab tests. Causes breast cancer cells to increase in lab tests; promotes formation of "bad estrogen" linked to increased breast cancer risk.
Ethalfluralin	Herbicide used prior to planting of soybeans, dry beans, and sunflower seeds.	Caused marnmary gland tumours in rats.
Ethylene Oxide	Fumigant for spices, to sterilize cosmetics and hospital equipment.	Increased frequency mammary gland tumour and several other cancers in female mice.
Etridiazole (Terrazole)	Fungicide used to treat seeds and applied to soil.	Feeding to rats caused increase in mammary tumors.
Methoxychlor	Insecticide related to DDT. U.S. uses 1/2 million lbs./yr 60% agriculture, remaining for household, garden, commercial, industrial use.	Estrogenic response in lab animals. Breast cell culture tissues change in number. Changes in adult mice ovaries.
Oryzalin	Herbicide used for turf, almond orchards, and grape vineyards.	Caused increased mammary gland tumors in female rats.
Prometon	Herbicide	Causes mammary tumors in rats.
Propazine	Herbicide used prior to planting in sorghum production and after planting carrots, celery, and fennel.	Caused increased mammary gland tumours.
Simazine	Herbicide used in corn production, fruit, nuts and citrus orchards.	Increased malignant mammary gland tumors in female rats.
Terbuthylazine	Herbicide used to kill algae in commercial cooling towers, ornamental ponds, fountains, aquariums.	Increases mammary gland tumours in female rats.
Terbutryn	Herbicide used to kill unwanted plants prior to sorghum production.	Increases mammary tumours in female rats.
Tribenuron Methyl	Herbicide used in corn and wheat production.	Increases mammary gland tumours in females.

Source: C.Cox, "Pesticides and Breast Cancer " in Journal of Pesticide Reform, Spring 1996, Vol. 16, No. #1

***** Editors Additional Note: Known Endocrine Disrupting Pesticides***

port a tenfold increased risk due to a residue of lindane.

Israel, had a dramatic 8 per cent decrease in breast cancer deaths between 1976 and 1986 after the government banned two chlorinated hydrocarbon pesticides, lindane and DDT, in 1978. They had been heavily used in dairy farming and had caused high contamination levels in Israeli breast milk - far above average levels in the United States.[9] However other epidemiological studies, including a Danish study by Unger and occupational studies failed to find an association between organochlorine pesticides and breast cancer. Studies of occupational exposure to phenoxy herbicides

have showed mixed results. [10]

A 1993 study by Greenpeace suggests that all organochlorines contribute to hormone disruption and breast cancer. [11] Citing the problems of these substances' persistent, bioaccumulative properties, the study calls for the phaseout of organochlorine production and use. Organochlorine pesticides in common use today include endosulfan (on food crops), methoxychlor (in household garden sprays) and kepone. Chlordane, which has been banned for food crops in the United States, is still extensively exported. Residues of chlordane have been found on imported fish, rice, mushrooms, beef and squash. The Governing Council of the American Public Health Association has also unanimously approved Policy Statement 9304 urging American industry to stop using chlorine (two exceptions included the pharmaceutical industry and disinfection of public water supplies). The Council pointed to problems of endocrine dysfunction, developmental impairment, birth defects, immunosuppression and cancer from chlorinated organic compounds.

In 1995, at a final negotiating session on the marine environment sponsored by UNEP, agreement was reached by ministers from 110 countries to develop a global, legally binding instrument for the reduction and/or elimination of twelve of the most persistent, bioaccumulative organochlorine chemicals which have been found to pollute the marine environment. Among the twelve substances, several pesticides have been identified including aldrin, endrin, DDT and dieldrin.

Sixteen pesticides now in use in the U.S. have been linked with breast cancer in laboratory tests. These include triazine herbicides, including atrazine, and cyanazine, which have been shown to cause mammary tumors in female rats. [12] Numerous studies have shown that children may be even more at risk from these pesticides than adults. A recent report by the National Research Council in the U.S. found that children differ both qualitatively and quantitatively in relation to pesticide exposure. Studies by the National Academy of Science completed in 1993 found that pesticide residues in many baby foods. Data from the U.S. Department of Agriculture's, Pesticide Data Program shows that washing, peeling and preparing food for consumption does not necessarily remove or decrease the number of pesticides present in fresh fruits and vegetables. The many inert substances in pesticides have unknown impacts on vulnerable populations such as children and older people (inert substances are ingredients not covered by current pesticide regulation because they do not impact target pests) found in pesticides. [13] A multi-agency federal task force is currently working on these problems.

Precautionary actions to prevent cancer are ultimately cost efficient, life sustaining and environmentally sound. Prevention of breast cancer, however, has been given relatively little attention in contrast to treatment and elusive cures. While early detection may lengthen a woman's life, it is not prevention. There needs to be a recognition of the existence of a global, environmentally induced cancer epidemic, and demand for removal of carcinogenic substances (from the environment) that have particular adverse effects on women and children.

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Source: Extract from 'California', Environmental Links to Breast Cancer Handbook, A Women's Environment and Development Organization (WEDO) Action for Cancer Campaign Report, January 1997.

Section Three

Alternatives

A Pesticide Free World?

by Meriel Watts

Introduction

Pesticide use in agriculture is profoundly unsustainable – it is in fact the most un sustainable factor in modern agriculture, and is the prop for many other unsustainable agricultural practices. When agriculture is caught in a cycle of ever-increasing chemical needs, undermines the very resources on which it depends (the fertility of the soil ecosystems, the presence of predator insects, the availability of uncontaminated water supplies) and also creates super bugs and weeds resistant to chemicals, it is a system that will ultimately collapse.

Any practice that results in the contamination of groundwater and rainwater, decreased fertility of acquatic animals, mutations in marine mammals, and causes ill-health in humans cannot be justified on a long-term basis or even on a short-term basis. The use of pesticides also reduces agriculture to unstable monoculture cropping systems vulnerable to pests, and leads to loss of vegetation. The use of pesticides also goes hand in hand with that of chemical fertilizers, and results in soil nutrient pollution, contaminated groundwater, eutrophication of waterways, etc.

On the other hand, if pesticides were not to be used, farmers will rely on a host of other, more environmentally benign techniques to protect crops – all aimed at providing a balanced ecosystem in which crops, pastures and beneficial insects flourish, but pests and weeds do not. A sustainable system will increase organic matter in soils, diversify crops, integrate trees with crops and animals, and conserve biodiversity. The emphasis is on creating long-term ecological stability, not a quick return on capital regardless of the cost to human health, the environment and the requirements of future generations. A quick chemical fix often undermines the long-term sustainability of the entire system. This must be avoided.

Growing Without Pesticides

Growing without pesticides, however, means more than simply removing these chemicals from our shopping list. It requires a great deal of positive management input to create a healthy balanced growing system, which defends itself, as much as possible, against unwanted intruders.

The most important means of disease and pest control in an organic growing system is creating the ability to resist infestations through a high nutrient soil – this does not refer to NPK (nitrogen, potassium, phosphate) but rather to the overall balance and appropriate supply of all nutrients, including trace elements, humic compounds, etc in the soil. Such a balance can never be achieved by artificial fertilizers which rely on a quick fix by a few elements, easily leached out into the groundwater, but must come from the more complex and long-lasting natural nutrient sources – compost, fish fertilisers, seaweed, other plant extracts, etc. These materials release their nutrients in a slow and sustained way.

Along with this goes the sensitive ecological balance that encourages predatory insects and other natural biological control agents to coexist and keep pests and diseases below economic thresholds. Any intrusion by herbicides can destroy habitats. Fungicides, fumigants and insecticides can deplete populations of beneficial organisms.

This is the basis of good organic growing. Box 1 contains other aspects of ecological pest management, which go a long way in ensuring a successful growing system.

If these basic concepts of pest management are followed, there should be little trouble with the food growing system. Often, though, in the process of conversion from chemical to organic growing, pests can become a temporary problem before a suffi-

BOX 1: Ecological Pest Management (EPM)

EPM requires an understanding of the ecological factors which allow a species to reach pest status, and places reliance on non-chemical methods of control, including the use of:

- **selection of crops and animals appropriate to the Environmental conditions of the region, and the microclimate in a given area.**
- **resistant and tolerant crops**
- **cultivars that demonstrate allelopathy (i.e. produce chemicals that inhibit weeds)**
- **improved soil health**
- **trap crops**
- **vegetation and residue management**
- **mixed cropping**
- **mixed stocking**
- **alley cropping/agroforestry**
- **pasture management techniques**
- **crop rotation**
- **companion planting**
- **natural enemies**
- **biological controls**
- **various cultural methods**

Source: Meriel Watts, Ecological Agriculture in New Zealand, Greenpeace New Zealand's Submission to the Ministry of Agriculture and Fisheries on M.A.F. Policy Paper 106: Sustainable Agriculture, A Policy proposal, 1991.

cient balance is achieved for the system to function properly. In this case, it may be necessary to resort to a few of the low-risk pesticides that are acceptable to organic certifiers on a restricted basis (See Box: 2). It must be emphasised that this is only a temporary measure. Long-term success depends upon the positive management input.

Box 2: Some Low Risk Pesticides And Pest Control Measures Generally Acceptable For Organic Growers

A. Fungicides:

Bordeaux mixture
Copper hydroxide
Sodium bicarbonate - powdery mildew; black spot on roses

Sulphur
Vegetable oils - powdery mildew
Lime sulphur - fungus, lichen, also insects

B. Insecticides:

Diatomaceous earth
Garlic
Pyrethrum
Fatty Acids (potassium salts)
Soapy water
Mineral Oils
Derris Dust
Bacillus thuringiensis
Quassia
Ryania
Codlin moth traps
Pheromones

Acceptable Pest Management [1]

'Acceptable pest management' is my term for a pest control decision that comes at the end of an analysis of the pest problem. It's a basic system of analysis that can be applied to all pest situations, whether in the garden, on the farm, in a wider national sense, or even for city councils.

1. Is the 'pest' really a pest?
2. If the 'pest' is in fact a pest, then can it be utilized as a resource in the process of control? Possums and rabbits are obvious candidates for this, but what about thistles (high mineral content)? Garden weeds can be a good source of food because of their high mineral content, and perhaps therefore unnecessary?
3. To what level does the pest need to be controlled? What is the economic threshold? Is there an economic threshold, or is this simply cosmetic, and per-

haps therefore unnecessary?
4. What management techniques are available to control the pest and prevent its reinfestation?
5. Failing all else, what is the least toxic way in which it can be controlled? Are there any organically allowable, substances that will do the trick? Biological control options?

Principles of Ecological Agriculture [1]

Beyond organic growing, in order to be sustainable, an agricultural system must be ecologically sound, economically viable and socially just. They must seek to work with natural systems rather than against them and be based on an holistic approach which recognizes that:

a) farms are complex living systems closely tied to the broader environment;
b) farming patterns not only impose patterns on the land but also on human communities;
c) farm communities must have sustained income as well as sustained agricultural resource base;
d) and farm animals have the right, as do all creatures, to living conditions which allow them to fulfill basic behavioural needs.

Agricultural policy and practice must therefore:

1. Encourage biological diversity within the agricultural system, by avoiding the use of pesticides, large-scale monocultures and genetically modified organisms, and by integrating forestry and agricultural systems.
2. Ensure that both types and quantities of crops and livestock raised are compatible with local and regional climate, soil and water conditions, so that crops are not subject to pests and diseases for which they have little tolerance nor are dependent upon environmentally destructive irrigation, and that animal health is not compromised by their unsuitability to local conditions.
3. Protect plant and animal wildlife habitats, including tropical and temperate primary forests, wetlands and other wildland areas, from intrusion by agriculture.
4. Avoid reliance on imported animal foodstuffs, particularly protein rich products that represent an import of excess nitrogen into the farm system, and emphasise instead the use of farm-derived food for animals.
5. Promote ecological pest management, based on preventive husbandry techniques, such as the selection of crops and animals appropriate to the environmental conditions, use of resistant and tolerant strains, enhancement of natural enemies, improvement of soil health, encouragement of biodiversity, crop rotation, fallowing, etc; and on the appropriate use of biological controls.
6. Ensure the sustainability of soil resources by:
   i. improvement of soil fertility, structure and microbiology and minimisation of nutrient leaching through ecological plant nutrition, and
   ii. prevention of erosion, desertification and salinity through irrigation.
7. Ensure the sustainable use and protection of all water resources (ground, surface, rain, marine) by:
   i. preventing contamination by nutrients and chemicals,
   ii. insuring that extraction for agricultural purposes does not threaten the integrity of rivers and associated wildlife and fishes nor of ground water supplies, and
   iii. protecting wetlands and upland forests for integrated watershed management and flood prevention.
8. Minimise energy input and use of non-renewable resources, such as fossil fuels, by substituting manures and compost for artificial fertilizers and utilising on-farm renewable energy sources.
9. Improve post-harvest storage, distribution and handling in order to minimize wastage.
10. Ensure the humane treatment of farm animals, particularly through the design of rearing systems which permit animals to meet their basic behavioural needs.
11. Maximize the intrinsic qualities of agro-ecosystems, in line with the above ecological principles, to assist them to better tolerate climatic stress imposed by global warming. This includes increasing organic matter in soils, diversifying crops, integrating trees with crops and livestock, and conserving biodiversity. It also involves the reintegration of wild relatives of food crops and 'outdated' cultivars into the agricultural system as climatic conditions change.

Social and environmental issues are inextricably linked; humans are the major cause of environmental destruction, and social inequity is a major vehicle for this. Nowhere is this more evident than in the ecologically destructive and socially damaging agricultural systems that impose

their pattern not only on the land but also on human communities.

Socially just agriculture must therefore:

1. Promote equitable consumption patterns between and within nations, emphasizing improved diet and food security for the world's poor.
2. Emphasise regional food security and self-reliance, and meet local needs before export requirements.
3. Produce healthy, nutritionally sound food that is appropriate to local needs and regional markets.
4. Shift emphasis in achieving food security away from increasing primary production through the use of ecologically damaging inputs towards improvements in harvesting, storage, processing and distribution of food.
5. Value cultural diversity and land management systems, recognizing communities as valuable sources of ecological knowledge, biodiversity and agricultural innovation.
6. Facilitate greater equality for the participation by women in ecological agriculture, including better control over productive resources and access to information, recognizing their status in many developing countries as the prime food growers.
7. Promote rather than damage human health.
8. Protect the livelihoods of small farmers, farm workers and rural communities, and promote their rights to participate in community-based decision-making and economic development.
9. Ensure equitable access to productive natural resources, including land, and to appropriate information and technology.

Living Without Pesticides

The effects of pesticides on agricultural workers in New Zealand, the majority of whom are men, has not received much attention for several reasons. Firstly, most of the workers wear at least some protective clothing and many are moderately well trained in so-called 'safe' use of the chemicals. Secondly, the agricultural and horticultural industries have operated a closed-door policy on the adverse effects of those pesticides. Stories abound about the long-term health problems suffered by spray applicators but very few have had the courage to speak publicly of these effects, such is the intense peer pressure to keep it quiet. When growers have spoken out, they have been ostracised, bullied, and threatened by their neighbours and communities to the extent that their lives have been all but ruined.

Much more attention has been focussed on involuntary exposure of the non-user, either as spray drift or as food residues. The actual and potential effects of that exposure are sufficiently great to have caused a long and protracted struggle against the use of pesticides, that struggle traditionally being dominated by women.

Auckland City Weed Management Policy

Auckland City's Weed Management Policy[2] provides a rare example of an outright campaign win. For many years urban authorities all round New Zealand have sprayed herbicides along the sides of roads, footpaths, fences, and in parks, sportsgrounds and natural bush reserves, causing protracted disputes with their citizens. In Auckland City the conflict has been particularly intense, for at least the last 13 years. The main concern has been spraying on the roadsides; it takes place 4-5 times per year and is virtually inescapable for those who do not want to come into contact with pesticides. Roundup is the main herbicide used but many others, like 2,4-D, 2,4,5-T, amitrole and simazine, have been used in the past.

The conflict has therefore centred on the adverse effects of low level exposure to Roundup, and in particular its effect on people who suffer from multiple chemical sensitivity (MCS). This is largely because many of the leading activists suffer from MCS and have experienced the repercussions of exposure to Roundup. MCS is defined as the loss of tolerance to chemicals as a result of exposure to various toxicants, followed by the triggering of symptoms by extremely small amounts of previously tolerated chemicals, drugs and foods[3]. It is a controversial subject for it involves the triggering of health effects at levels of pesticide exposure that are generally regarded as being too low to cause adverse effects on the average human being, according to results from laboratory trials in which animals are exposed to much higher doses. Thus MCS is not recognised in the toxicological studies used to register herbicides, but is increasingly recognised in medical literature[4].

The causes of MCS include a single exposure to a large dose of a toxic substance (such as to Agent Orange in Vietnam or to isocyanate following the Bhopal explosion); exposure to ambient doses of toxins after childbirth, surgery, or severe bacterial, viral or parasitic infection; or from accumulative subacute toxic exposures over time[5]. The latter is the most common cause in countries such as the U.S. and New Zealand. Table 1 provides a list of the most frequently occurring symptoms.

There is one other important aspect of MCS: most researchers have reported that women are far more likely to suffer from it than are men. In 1991 Ashford and Miller[6] reported that 70-80 per cent of sufferers are women, and most subsequent studies tend to confirm this finding. The more chauvanistic of researchers [7] have suggested that this is somehow a result of a pre-existing psychological gender-based neurosis or emotional disorder rather than an effect of chemicals. However more rational researchers have provided evidence that oestrogen may enhance the effect of chemicals on the nervous system[8]. Given this, it is not surprising that by far the majority of grass roots activists working on the toxic chemical issue are women - Merchant[9] recorded that during the 1980s in the USA 80-85 per cent of grass root activists in the 'anti-toxic movement' were women.

That is certainly the case in New Zealand. The struggle to get Auckland City to stop herbicide spraying on the roadsides has been lead by women, mainly from five different groups, but also as individual citizens. It also involved whole streets of residents and a school. For 13 years they (we) made telephone calls, wrote letters, gathered signatures for petitions, and arranged deputations, submissions and expert witnesses, such as doctors and lawyers, to various Council meetings. Eventually the Council grew weary of the conflict and directed that a report on weed management be prepared, and include the environmental and health issues. A Weed Management Consultative Group was established (WMCG). Led by a council officer, it included a weed control contractor, an independent environmental researcher, a chemical residue analyst (all men), and most importantly, representatives (all women) of the three main public interest groups most involved with the issue: Toxins Awareness Group (TAG), Soil & Health Association and Community Awareness of Pesticides.

Two consultants were employed by the Council, but concern was expressed by TAG at their apparent bias, for they had little knowledge of the health effects of herbicides and a greater interest in controlling weeds than in reducing the public's exposure to the chemicals. To redress the imbalance TAG requested that this author, as the representative of the Soil and Health Association on the WMCG, be contracted as an additional consultant. This was agreed.

The policy development process involved close communication between the consultants and the WMCG on each aspect of policy development, from scoping the project and developing the methodology to agreeing on the wording of the final document. Debate was sometimes furious, but the policy was agreed and eventually adopted by Auckland City Council, this year. Not, however, without further immense effort from the public interest groups whose efforts were constantly undermined by some of the council staff and councillors determined to continue the herbicide use. It became an issue in the 1998 council elections, and was supported by many candidates who eventually were elected. More effort was required to keep them to their campaign promises, but we succeeded in the end. The whole process was enormously time consuming and

Table 1: Symptoms of Multiple Chemical Sensitivity

Respiratory system	Nervous System
wheezing	hyperactivity/attention deficit
chest tightness	behavioural changes in children
hoarseness	mood alterations
dry cough	sleep disturbances
nasal symptoms	memory problems
sinus discomfort	loss of concentration
throat discomfort	slurred words/difficulty finding words
	coordination difficulties
Gastrointestinal system	feelings of unreality/light-headedness
nausea	headache
frequent unusual thirst	unusual fatigue
bloating	dizziness
diarrhoea	irritability
irritable bowel	anxiety, panic
renal pain	depression
reduced bladder control	neuropathy
	tremor or shaking
Other	odour hypersensitivity
muscle twitching/spasm	reduced cold tolerance
joint discomfort	reduced heat tolerance
transient urticaria	noise sensitivity
dry red skin	changes in hearing, ringing ears
flushing skin	changes in eyesight
rapid pulse	
palpitations	
swollen glands	
menstrual disorders	
breast and ovarian cysts	

Sources: Bell et al. 1997; Levy 1997; Miller & Mitzel 1995; Ziem 1994; Ziem & McTamney 1997

Table 2 - Multiple Chemical Sensitivity

Dr A comments on a lack of awareness of the medical profession of chemical sensitivity and on the lack of testing facilities in New Zealand. Dr A also comments that in his experience, exposure to the GII version of Roundup results in a "different profile of symptoms compared with the old formulation, that are more varied from patient to patient, and thus harder to recognise without some experience in the field".

Dr A provides the following symptom pictures for some of his patients, all of whom are claimed to have responded positively to treatment for exposure to GII:

1. Vomiting, diarrhoea, elevated temperature, slept very long hours for a week wanting only water for 4 days, personality change to that of a "tyrant"; ill for 4 months.
2. Cramps in feet, dizziness, vomiting, migraine, diarrhoea for 3 days, weak; ill for 4 weeks.
3. Tired, frequent waking during night, night sweats, sore tonsular glands, watery discharge from sinuses, "achey burning" joints, tender gall bladder, nausea, "background thickness to her thinking"; ill for one month.
4. "Gunk" in back of nose, tight muscles top of back, shoulders and up into head, headache, fatigue, restless legs at night; ill for 3 weeks.
5. Chest pains, discomfort in head and neck, pressure in bladder and bowel during night, loss of appetite, weight loss, gastric reflux, "prickly feelings throughout body", raised blood pressure; ill six months plus.
6. Sudden onset of palpitations, restlessness, clammy tingling hands, diarrhoea, marked hunger ("had to eat to feel normal").

Source: Extract from Weed Management Policy for Auckland City (Davis et al. 1998, p.91).

exhausting, and it was only sheer dogged determination that enabled those involved to see it through to final success.

There were three valuable outcomes of this exercise. Firstly, for most part spraying of herbicides in public places in Auckland was stopped; already 95 per cent of the roadside weed control is non-chemical, and hopefully this will encourage other urban authorities to follow suit. Secondly, recognition has been gained for the condition of MCS, for as part of the policy development process a number of general medical practitioners gave evidence of the existence of this condition and of the effect of low levels of Roundup on their patients (refer to Table 2). Thirdly, a precedent was established, in New Zealand at least, for a pesticide policy process in which the public were involved in an effective decision-making role[1*], and which excluded the chemical companies (Monsanto did try to undermine the policy document, particularly with respect to MCS, but they failed[2*].) It is this third achievement that will have the most profound long term benefit, for the policy has focussed some degree of attention on the demand for public participation in the actual decision-making process of public policy, not just the facade of consultation and submissions, and has proven the effectiveness of that participation.

Conclusion

Pesticide advocacy in New Zealand has achieved some excellent results. Some of these are quite obvious, such as stopping the spraying of herbicides on the streets of Auckland. Other results are less obvious, but perhaps more profound. These include the involvement of members of public interest groups as paid, effective participants in policy development, the partial recognition of multiple chemical sensitivity, and the recognition of the trespassing nature of spray drift. It is women who have, for the most part, taken the lead in this work, in so doing challenged the male defenders of the status quo[3*]. The development of networks and coalitions has added strength to the advocacy work, as has the ability to provide positive alternatives, be they non-chemical weed management methods, new legislation, or organic agriculture. The advent of genetic engineering has also been an odd ally, in that its promoters frequently talk of the benefit of the technology in reducing pesticide use; such talk has helped confirm people's suspicions about pesticides, and in New Zealand at least, has been driving people to the organic produce stores in record numbers.

In conclusion I would like to quote Robert Shapiro of Monsanto Corporation. In referring to European opposition to his company's genetically engineered products, Shapiro conceded that Monsanto had been naive, but that "eventually, scientific proof should win over consumers"[10]. Those are the words of a man fighting a desperate battle which he will inevitably lose, for he is quite wrong.

The future lies in the hands of the consumer, the public, and particularly, women.

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Additional Notes:

[1] One of Three consultants and four of eight members of the Consultative Group were from public interest groups.*

[2] Monsanto requested a copy of the draft document. Their comments on it were largely disregarded as being unsubstantiated opinion; where supporting documents were supplied they were frequently inadequately titled, authored or dated to be used in a policy document.*

[3] Conversely it is men who are taking the lead in promoting organics.*

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Source: Edited Extract from 'Poisoning of New Zealand', Meriel Watts, Auckland Institute of Technology Press, 1994. And, extract from Presentation on Pesticide Advocacy in New Z ealand, at the Regional Workshop on Women and Pesticides, "Women Protecting Health and the Environment", Penang, Malaysia, August 24 - 27, 1999.

What is Sustainable Agriculture?

by K. Prabhakar Nair

Getting in Tune with Alternatives

Faced with growing problems with intensive chemical agriculture, countless communities and individuals around the world are now adapting alternative and sustainable farming methods. These practices are known by various names, and involve many techniques — sustainable agriculture, ecological agriculture, organic farming, biodynamic farming, etc.

Basically, sustainable agriculture seeks to eliminate or minimize the use of synthetic chemicals in farming, but, viewed in a larger context, the concept goes much beyond into a wider, holistic set of farming, ecological and social practices. These practices must be ecologically sound, culturally sensitive and socially just.

Ecologically, sustainable agriculture seeks to strengthen the vital relation between the soil, plants, animals and human beings. It regenerates and enriches the soil and does not deplete it, by using integrated soil fertility methods instead of chemical fertilizers. Among other things, it uses:

- ecological pest management instead of pesticides;
- polycultures to harness biodivesity instead of monocultures;
- alternative breeding strategies to produce plant varieties adapted to ecologically sound practices instead of chemically addicted seeds;
- soil and water conservation techniques instead of practices that lead to soil erosion and water depletion;
- and humane animal-raising methods instead of chemical-based "factory-farming" of animals.

In short, it works in tune with nature and seeks to enrich it instead of degrading and depleting it.

Of Traditional and Indigenous Knowledge

Culturally, sustainable agriculture should be sensitive to diverse cultures, particularly indigenous cultures, their farming systems and nutrition patterns, and their ecological knowledge acquired over the centuries. Over half the world's population lives in rural areas, closely linked to producing food, and about 20 per cent of this rural population consists of indigenous cultures with vast innovative experience and intimate knowledge of diverse foods and ecosystems, which also form the basis of their food security. According to a United Nations Development Programme study (conducted by the Rural Advancement Foundation International [RAFI]), "at least half the world's population relies on indigenous knowledge and crops for food supplies." For agriculture to be sustainable, it must be sensitive to this vast store of knowledge and try to preserve the diversity of these food crops and food systems, and not destroy them in the name of "standardization" and the aggressive promotion of global trade in foods. The bulk of this indigenous knowledge and biodiversity is in the developing countries spread across Asia, Africa and South America.

Socially, sustainable agriculture should seek to ensure justice and equity at all levels, from gender relations and distribution of resources to agricultural trade policies. This means fair trade in agricultural products, land rights to farmers, farmers' control over agricultural resources and supplies, gender justice and empowerment of women. This is particularly relevant for Asia, where landlessness is a major problem and most farmers do not own the land they work on, and where women, even though they dominate agricultural work, face social discrimination in terms of land rights and access to other agricultural resources.

Europe Looks Towards More Sustainable Strategies

According to the European Commission (EU), its agricultural subsidies will be linked to environmental-friendly practices "where appropriate" in order to promote farming methods that enhance biodiversity. Biodiversity concerns will be integrated into the reform of the EU Common Agricultural Policy scheduled for 2000. These objectives are included in the Commission's proposed European Biodiversity Strategy, issued in February, 1999. The strategy is part of the EU's obligation to comply with the UN Convention on Biological Diversity agreed at the Rio Conference in 1992. The Commission's proposals list general policy objectives for the strategy, which will be used to develop and implement action plans. The development of the action plans is expected to be completed within the next two years.

Meanwhile, a five-year study in Germany has concluded that a switch to organic farming would be profitable providing farmers receive higher prices for their produce. This will compensate farmers for generally lower yields for their plant and animal produce. For cereals, a yield loss of 37 per cent was observed for the initial four years, due to less intensive organic farming methods. The study was organized by the Federal Research Station for Agriculture, the FAL (Braunschweig, Germany). It involved the monitoring of 107 organic farms (380,000 ha) in West Germany from 1990 until 1995. Farmers received annual subsidies of DM 300-510 ($170-290)/ha.

Source: AGROW No 299, February 27, 1998.

The Farmer Consumer Connection

Sustainable agriculture also depends on a close co-operation between farmers, consumers and local communities. Indeed, such co-operation is at the heart of sustainable agricultural systems. Consumers and local communities need to support and sustain farmers while farmers need to respond to the needs of local communities in providing healthy and wholesome food and maintaining a healthy environment. Such community-supported agriculture (CSA) has become popular in Japan and the US. Consumers and farmers have evolved a system where they meet and discuss their needs — consumers their requirements, and farmers the price. Cropping patterns and prices are then worked out accordingly.

The concept of community-supported agriculture originated in Japan about 30 years ago when a group of women sought to establish a direct link between consumers and local farmers in an attempt to counter the rise in food imports and a decline in the number of farmers in Japan. This system of mutual support among farmers and consumers was called "teiki", meaning "putting the farmers' face on food". It gave greater social meaning to both farming and consuming. Later, as the health and environmental effects of modern agricultural chemicals became a problem in Japan, more consumers started demanding uncontaminated food and farmers, worried about the declining soil fertility, started turning to chemical-free organic farming. This organic farming movement has now grown into a much wider food-producing and distributing "teiki" or community-supported system.

Spreading the Sustainable Word

Several groups in other Asian countries have also developed sustainable agriculture in response to local problems and needs –in the Philippines, Thailand, Bangladesh, India, among others. In the Philippines, for example, a group of farmers and university scientists collaborated to develop sustainable rice breeding and farming techniques adapted to local weather conditions; an important factor in this development was the use of indigenous knowledge.

In Bangladesh, the "Nayakrishi Andolan" (See Box: New Agricultural Movement), a community-based movement for sustainable agriculture is gaining popularity. Indonesia, which faced an explosive brown plant hopper pest problem following intensive pesticide use in rice farming (the pesticides had also killed the beneficial natural predators of the pest), successfully used ecological means of pest management in which local farmers were closely involved. Such Integrated Pest Management (IPM) is now evolving into a sustainable ecological concept, centred on farmer and rural community participation in decision-making.

Meanwhile, in Europe, an increasing number of groups are practicing organic farming, supported by consumers conscious of the adverse health and

Farmers of Sungai Buaya, in the state of Perak, central peninsular Malaysia making bamboo incubating cannisters (housing stem borers larvae carrying parasitic spawn) as part of their IPM activities involving pest control. Photo: PAN AP.

environmental effects of chemical-intensive farming. Coming under increasing pressure from such consumers and farmers, several governments in Europe have extended support to these efforts and have set specific time-bound targets for the growth of organic farming in their countries. (See Box: Europe Looks Towards More Sustainable Strategies) Simultaneously, several European countries have also initiated programmes for reducing the use of chemical pesticides in their agriculture ***(See Article 'Policies for a Safer Future' in Section Four).***

Source: "Eat Smart, Healthy, and Local", PAN AP Safe Food Campaign, 1996

Bangladesh's New Agricultural Movement

by Farida Akhter

Farmers of the Nayakrishi Andolan (New Agricultural Movement) in Bangladesh are organized against "beesh" which, in Bangla, means poison – an apt term for pesticides!

Chemical fertilizers and pesticides were introduced into farming in Bangladesh in the mid-60s as part of the high-yielding variety (HYV) farming technology. Farmers were given fertilizers free of cost, or were given credit and free training to use pesticides by the State. Laboratory-developed HYV paddy seeds and pump sets to extract ground water for irrigation were part of this "green revolution" package.

However, the farmers soon found that the monoculture of HYV seeds narrowed the genetic base of agriculture. From at least 15,000 varieties of rice, Bangladeshi farmers soon ended up with only 8 to 12 HYV varieties. After some years of increased "productivity" under chemical farming, soil fertility began to decline. And the heavy extraction of ground water for irrigation resulted in a water crisis and arsenic poisoning in water in many districts. All this lead to a massive crisis, which Bangladesh could hardly solve.

Beware the Wrath of Women

So women farmers are now angry. They say the so-called modern agriculture had destroyed their land, the life forms around which sustained them, their culture and their lives; they see the loss of a vast variety of paddy, vegetables, fruits and fish as a tragedy. For the new generation of children, accounts of these natural richness and diversity are now merely stories told by grandmothers: *"We had this, we had that..."*

The male farmers, who had turned greedy, have now realized their mistakes. They had miscalculated the "benefits" of the new technology.

But farmers in Bangladesh are not the ones to sit around and merely mourn this loss. The region has a strong history of peasant movements. "We will not allow our produce to end up in the stores of the exploiters, we will resist; we will not accept death from hunger...," goes an old song from the farmers' movement in the region in the 1950s, demanding the rights of and justice for food producers. And the spirit still lives on.

Continuing the Struggle

The Nayakrishi Andolan is the continuity of this history. But this movement is not only about pesticides and chemical-free farming, but goes much beyond in concept and content. The Nayakrishi women's movement against "beesh" is also a manifestation of women's struggle against the new form patriarchy reinforced by globalization and modern technology. Modern agricultural technology has undermined women's role and socio-economic status in society. For example, because seeds are now available in readymade packets and rice is husked in the mills, women are not needed anymore for seed selection and preservation, germination and post-harvest work — which were their traditional roles.

The new technology disempowered them drastically. Women, who were once the backbone of the agrarian Bangladeshi economy, now became "valueless or simply machines meant to produce children". And as poverty and distress increased in families, violence against women rose, increasing the number of suicides in areas of intensive agriculture (using fertilizers and pesticides). Women used the same "beesh", meant to kill pests, to kill themselves.

With the increase in poverty in rural homes on the one hand and the rise of the global market on the other, rural women are now available as a cheap source of labour for export-oriented indus-

tries. They are also targets for dumping contraceptives and testing new drugs. And young girls are trafficked out of the country for sex, slave and organ trades.

The Nayakrishi Andolan must be seen in this context. It is not a new technological fix for the problems created by "green revolution", it is a matter of survival and struggle against all these processes. At the same time, the movement seeks to reclaim agriculture and food production as an act of "celebration" or *ananda*, a way of life which is totally different from what the new food traders and transnational corporations would propose. While being economically gainful for the food-producing communities, it sets much store by ethical and cultural values.

The movement is based on the very basic principle of observing and following the processes of life and nature in its "profound act of creation" and its immense diversity. It emphasises the joy of participating in these integrated, creative and life-regenerating processes of agriculture as against the fragmented and life-threatening processes of modern chemical-intensive agriculture. To participate in these activities meaningfully and creatively through agriculture, the farmers need to "challenge existing relations" that assert hierarchy, control, exploitation, destruction (in place of creation) and fragmentation (in place of integration) — all of which are unsustainable practices.

The movement follows ten basic rules:
(1) Absolutely no use of pesticides (instead pests are controlled by mixed cropping, promotion of biodiversity, development of high quality local seeds, etc).
(2) No use or gradual decrease in the application of chemical fertilizers (instead the focus is on soil management).
(3) The use of multi-cropping and mixed cropping, crop rotation, agro-forestry and other methods to retain and enhance soil fertility and to enhance soil productivity.
(4) Agro-forestry and integration of fuel wood, fruit and various multi-purpose trees with rice and vegetable cultivation (with farmers being involved in research to identify appropriate local species).
(5) Calculation of the total yield of the system (instead of the quantitative yield of a single crop as in "green revolution" farming).
(6) All domesticated and semi-domesticated animals and birds are to be treated as members of the farming households (the production of local variety of crops provides fodder for the animals, livestock and poultry production is integrally related to the diversity of crops, and local varieties of livestock, poultry and fish are preferred).
(7) Agriculture is also aquaculture (aquatic biodiversity, including various fish species, is an integral part of agriculture; varieties of fish can be grown if land and water is kept free of chemicals and poisons and agriculture is designed to support the habitats of different aquatic species and varieties. (It must be noted that fish is an important part of food systems in Bangladesh).
(8) Seeds and genetic resources are the common resources of the community and must be conserved at the household and community level.
(9) Water is wealth (water is the source of conserving the biodiversity of plant and fish resources. (The movement emphasizes the creative use of water; rural planning of homestead, landscape and topology takes advantage of water as resources, and, particularly for Bangladesh, floodwater as a "vital element" of agricultural practice).
(10) Stop the use of deep tube wells and extraction of ground water (after the green revolution experience, the emphasis is on evolving innovative irrigation systems with surface water) .

Over 50,000 farming households in Bangladesh today practice Nayakrishi. The movement has shown that small farmers can manage, regenerate and produce "amazingly" diverse crops, timbers, fuel wood, medicinal plants, fish, livestock and other products (and without the use of pesticides). In some areas, the Nayakrishi farmers now cultivate at least 120 varieties of rice. In some villages, farmers do not require ground water any more and surface waters are used with ingenuity based on the local knowledge. The seed network between farmers of different areas collects and conserves seeds of local varieties and where possible Community Seed Wealth is set up. The farmers are aware of the privatization of seeds and genetic resources in the name of "patenting" or other forms of intellectual property rights in life forms. Resistance against biopiracy is being build up. "Keep seeds in your hands, sisters...", urges the movement!

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Source: This article is based on '"Beesh", Poisoning of Lives', a report on the Study on Women and Pesticides in Bangladesh, undertaken by UBINIG in collaboration with Pesticide Action Network (PAN) Asia and the Pacific; and information from 'Principles and Rules of Nayakrishi Farming', Nayakrishi Andolan, Bangladesh.

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Empowering Women with Indigenous Technologies

by Dr. K. Vijayalakshmi and Subhashini Sridhar

Introduction

Plant extracts offer an ideal source of low-cost, safe and effective pesticides, and women in many societies have been using them for centuries until chemical pesticides were introduced. Efforts now to replace chemical pesticides with non-chemical alternatives therefore need to empower women with a variety of simple village-based technologies.

The Centre for Indian Knowledge Systems in Tamil Nadu, India, has been conducting farm trials of such technologies with farmers, as well as conducting training programmes for them on these technologies. These efforts have helped farmers regain confidence in their own old technologies.

These alternatives to chemical pesticides include botanical pesticides, non-chemical methods of controlling rice pests, indigenous technologies for pest control and storage pest control. The following are examples of some of the alternatives to pesticides based on, and built upon, traditional methods evolved by farmers – the knowledge of which lies predominantly in the hands of women.

The Wonders of Neem and Other Botanicals

Many of the botanical pesticides are neem-based. These include:

- neem kernel extract for controlling green leaf hoppers, tobacco caterpillar, aphids, gram pod borer and white fly;
- neem cake extract for white fly, citrus leaf minor, root knot nematode, termite, leaf folder and brown plant hopper;
- neem oil spray for rice leaf folder, brown plant hopper, rice stem borer, aphids, powdery mildew diseases, leaf crinkle virus, cotton boll worm, diamond blackmoth and stored grain pests;
- neem, pongam (*Pongamia pinnata*) and aloe extract for aphids, white fly, army worm and cotton boll worm; and
- neem, custard apple, and chilli extract for brown plant hopper, green leaf hopper and cotton stainer.

Other plant-based pesticides include:

- ginger with other plant extracts in cow's urine;
- vitex, castor and calatropis extract for castor semilooper, pink boll worm and rice stem borer;
- vitex and aloe extract for leaf-eating caterpillar; and
- tobacco and chilli extract for the American boll worm, rice earhead bug, rice stem borer and brown plant hopper.

It is How You Treat the Seed

While all these pesticides are sprayed or dusted on plants in the field, pests can also be controlled by treating the seeds before sowing. For example, treating seeds with a solution of sweet flag (*Achorus calamus*) powder and cow's urine before they are sowed protects the plants against pests such as the army worm and large cabbage worm. .

However, care needs to be taken to use the right amount of these pesticide solutions and also to use proper and clean methods of collection. For example, neem seeds that are to be used for the preparation of neem kernel extract should be between 3 and 8 months old, because before 3 months or after 8 months, the amount of azadirachtin in the seeds is quite low and cannot be used for pest control.

Women preparing garlic extract during a training an non-chemical pest control in the village of Guruvanmedu, Kancheepuram District, India. Photo: Centre for Indian Knowledge System.

Women preparing neem seed extract during the training at Melaiyur, Tirupporur Panchayat, Union of Kancheepuram District, India. Photo: Centre for Indian Knowledge System.

Care also needs to be taken with the methods of preparation of the pesticides. In the case of neem kernel extract again, 50 grammes of neem kernel is required to be mixed with a litre of water. The neem kernel is pounded gently, after removing the coat, such that no oil comes out. The powder is collected in a muslin pouch and soaked overnight in the water. The pouch is squeezed and the extract is filtered the next morning. Khadi soap is added to the filtrate as an emulsifier so that it helps the extract to stick to the leaf surface. One millilitre of this emulsifier is to be added to one litre of water.

Techniques Tried and True

Rice pests can also be controlled by simple non-chemical methods. Rice stem borers, for example, can be controlled by proper spacing of plants and spacing between rows of plants, or the application of a husk-kerosene mixture (early in the mornings) or wood ash. For brown plant hoppers, a mixture of rice husk and kerosene (15 kg of rice husk with 3 litres of kerosene) can be applied early in the mornings on the under surface of the plants. In planting the seedlings, a gap of one foot should be left after every 8 feet, which lets sunshine reach the under parts of the plants, reducing pest incidence. Case worms can be controlled by dragging (twice) a string over the surface of the leaves after filling the rice field with water up to 6 cm and adding a litre of kerosene to it; the case worms will fall into the water which is then drained.

Leaf-eating caterpillars can be kept away by placing neem leaves at various places in the field; another low-cost method is to dust wood ash. Other ways to control leaf-eating caterpillars are to dust neem cake or pongamia cake powder over the rice plants 30 days after transplantation, or the use of fried castor seed paste (castor seed is fried, pounded and mixed in water into a paste, and placed in the field). For green leaf hoppers, neem seed extract can be mixed with cow's urine and sprayed over the crop (3-8 kg of neem seed powder in 5-10 litres of cow's urine and diluted with 50-60 litres of water). Tobacco leaf extract or a mixture of tobacco leaf powder, chilli powder and sand (as carrier) can be used to control rice ear head bugs (*Leptocorisa acuta*).

From time immemorial it has been a common practice in India to put dried leaves between folds of clothes to ward off insects. There are certain traditional practices which are followed even today. Mixing of neem leaves with rice, wheat and other stored grains is a well-known age old practice. Farmers often use a leaf paste with the mud container for storing grains. In South India and Sri Lanka, stored grains are also fumigated with the smoke of neem leaves.

Grains and pulses can be stored by mixing them with neem products such as dried leaf powder, neem seed powder or oil, and also by treating the gunnybags used for storing the grains with neem kernel solution.

Other plant-based products used in storing include turmeric powder and ginger rhizome powder. Castor oil can be used for pulses, and wood ash for vegetables and fruits. Wood ash is in fact very effective as a pesticide for stored grains, and offers good protection against beetles and other storage pests. Lantana leaf ash is effective against pests that attack in sprouts in stored potatoes.

These are only some examples of the rich and wide range of plant-based pesticides and other non-chemical methods for controlling pests.

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Source: The above article is based on the paper presented by Dr. K. Vijayalakshmi to the Regional Workshop on Women and Pesticides, "Women Protecting Health and the Environment", organized by Pesticide Action Network (PAN) Asia and the Pacific, August 24-26, 1999.

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The Organic Experience in Kerala

Long-term studies conducted by the Kerala Agricultural University in the state of Kerala, India, for evaluating the effects of organic manure and chemical fertilizers have shown that the use of organic manures gives higher yields than chemical fertilizers in Kerala's agriculture.

The experiments studied yield rates of rice crops, using only organic manure, only chemical fertilizer and combinations of the two, over a period from 1979 to 1986, covering two crops (seasons) in a year, and then ranked the manures in order of yield rates. The results showed that organic manures gave higher yields than chemical fertilizers and were "consistently superior" to chemical fertilizers. Or the use of "chemical fertilizer alone" gave consistently lower yields than the use of "organic manure alone" or the combination of both organic manures and chemicals.

Table 1 here summarises the results of the study.

However, shortage of organic manure is a "major limitation" of Kerala's contemporary bio-system. Faced with the shortage in the farm and the high cost in the market of organic manures, farmers have been forced to use chemical fertilizers. Earlier, farmers used a mixture of cowdung and leaves. But cross-breeding of cattle has since reduced the number of cattle per household and hence the amount of cowdung available. And the conversion of the earlier mixed tree systems into coconut and rubber plantations reduced the amount of green leaves. The traditional system's ability to yield organic manure has been considerably eroded through changes in land use.

Similarly, in pest control, the major thrust earlier was on the study of environmental conditions of pest infestation and the design of a combination of natural plant-based and manual methods of control, (See Table 2).

From the mid-forties, encouraged by the easy availability of chemical pesticides, farmers started shifting to the use of these chemicals. Though a few studies comparing the effectiveness of the two packages (natural and chemical) failed to show that chemical pesticides were more effective, the new practice continued. And after this transition, pest research got limited to the testing of specific chemical pesticides for particular pests and diseases

Table 1: Effect of Organic and Inorganic Manures

Ranking of Sources in the order of yield rates

Source	Year and Season* of Expt.												
	79A	79B	80A	80B	81A	81B	83A	83B	84A	85A	85B	86A	86B
P	2	1	1	1	1	1	1	1	1	1	3	1	2
Q	1	8	5	8	2	5	5	7	7	5	5	5	5
R	4	2	2	3	3	2	3	2	3	2	2	3	4
S	7	7	8	7	5	8	6	8	8	8	8	7	8
T	3	3	3	2	6	4	2	3	2	3	1	2	1
U	8	6	7	5	7	7	8	5	6	6	7	8	6
V	5	4	4	4	4	3	4	4	4	4	4	4	3
W	6	5	6	6	8	6	7	6	5	7	6	6	7

Sources and Doses:

P: Cattle Manure (CM) 18000 Kg/ha
Q: Green Leaves (GL) 18000 Kg/ha
R: CM+GL 9000 Kg/ha each
S: N Fertilizer 90 Kg/ha
T: CM 9000 Kg/ha + N 45 Kg/ha+ P 45 Kg/ha+ K 45 Kg/ha
U: GL 9000 Kg/ha + N 45 Kg/ha+ P 45 kg/ha+ K 45 Kg/ha
V: CM+GL 4500Kg/ha+ NPK (45+45+45)
W: NPK (90+45+45)

A: First Season B: Second Season

As regards weed control, the traditional practice was to hand-weed but the green revolution saw the introduction of weedicides. Of the several scientific experiments conducted to compare the efficiency of different chemicals against that of hand-weeding, "nearly one-third showed that hand-weeding was superior" and another one-third "indicated that hand-weeding was on a par with chemicals"; the remaining one-third "denoted the superiority of one chemical or the other". Thus the use of chemicals for weed control has "not been proven as a superior technique".

Source: 'Changing Acres—Issues of Sustainability in Kerala's Agriculture', V. Shanthakumar, Pesticide Action Network (PAN) Asia and the Pacific.

Table 2: The Package of Pest-Control Measures Suggested During the First Phase (until 1945)

Crop	Pest/Symptom/Disease	Method
Rice	Hispa Armingera	Winnowing by using sticky mixture of resins and oil boiled together
	Clipping of tips	Spraying fish oil insecticidal soap
	Stem Borer [Schoenobius Incertellus]	Draining water in the field and treating with a mixture of 100 lbs. of prawn dust and 100 lbs. of ash
	Rice Bug [Lepto Corisa Ocuta Th.]	Hand netting
	Case Worm [Nymphula dePunctalis G.]	Dressing of ashes mixed with fine loppings of Leucas Aspera plants
	Blight Disease	Pruning and burning of affected leaves
	Crabs	Trapping of the Crustaceaus in baited mud pots; letting in ducks during off-season
	Gall Fly	Increase tillering through the stimulant dressing of ash and cowdung, and thereby compensating the loss due to the galls
	Leaf Roller [Cnaphalocrocis Medinalis G.]	Pruning of the rolls and burning them
Coconut	Root Wilt Disease	Cutting down and burning affected leaves and spraying Bordeaux Mixture; additional manuring and sterialization of soil by burning and liming
	Nephantis Serinopa Trichospilus Pupivora F.	Releasing Euolophid parasite,
	Yellowing of Trees	Application of coconut husk, either simply burying it in between the rows of trees or applying it after converting into ash
	Stem Bleeding [Thielaviopsis Paradoxa]	Removing diseased tissues and painting with tar
Pepper	Root Wilt Disease	Destruction of all decaying stumps and allowing plenty of light and air and proper aeration of soil

Source: The Administrative Reports of the Agricultural Departments

Section Four

Policy, Advocacy and Campaigns

Policies for a Safer Future

by Sarojeni V. Rengam

A Contemporary Nightmare

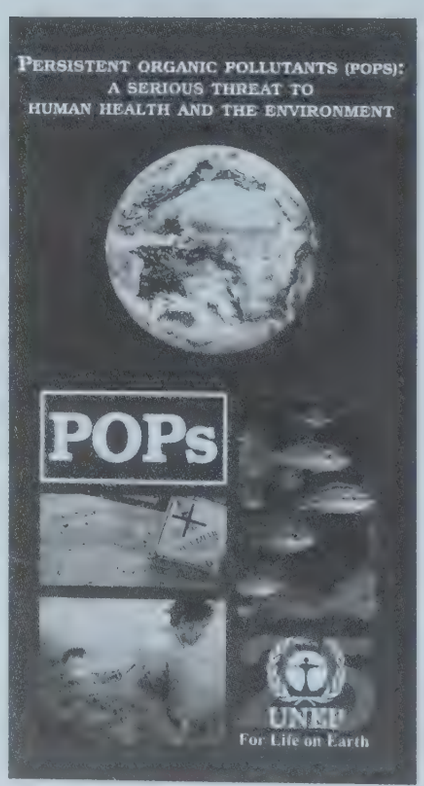
The failure of the Belgium government to take strong and immediate action against the dioxin polluters and stop the sales of products contaminated by dioxin created an international food safety crisis; and was instrumental in getting the political party then in power out of government in the recent elections. Citizens and consumers lost faith in the Belgian government's ability to effectively take action and safeguard the health of consumers locally and internationally. The crises also reflected the reluctance of implicated governments, not only Belgium, to undertake measures that may conflict take measures that may conflict with its trade and economic interests.

Dioxin is one of the most toxic chemicals known. A recognized carcinogen, it is also linked to endocrine disrupting effects including lowered sperm counts, reproductive and developmental problems, breasts and testicular cancers and endometriosis[1].

Concerned about Belgian and European food products that may have been contaminated with dioxin, countries such as Malaysia issued a ban on the sale of all products suspected of being contamination from sale in the local market. At the local level, the alerted public avoided consuming the suspected products. However, more significantly, the incident created awareness and initiated discussions on food safety issues—including contamination and hazardous residues in our food.

The Belgium fiasco highlighted the fact that increasingly, consumers are not willing to compromise on the safety of their food. And that they have a right to know and be informed, and have the right to choose if they are willing to risk such hazards in their food. Such a crucial issue of food safety and food contamination could, and in the case of Belgium did, ensure a change in government.

Similarly, the emerging concerns on the environmental and human health effects of endocrine disrupting chemicals—particularly on our children's health—are crucial issues that need to be addressed urgently at the policy level. It would be a disaster if we waited until all the scientific evidence is available before we took any concrete actions. Urgent action is needed now to reduce and restrict endocrine disrupting chemicals (EDCs). Concurrently, scientific research will need to continue to better understand the impact of these chemicals on our health and the environment, and their modes of action.



Information leaflet on POPs from the UNEP

Persistent Organic Pollutants

Policy initiatives on endocrine disrupting chemicals have mainly focused on bans and restrictions on specific pesticides, and other chemicals, as well as information to the public. One of the key policy initiatives at the global level has been the negotiations on a legally

Proof or Precaution: When Do We Act?

Most current regulations require strict proof of cause-and-effect relation between an individual pollutant and one or more diseases before action is taken to restrict the use and production of a chemical. To prove such a link, a specific and statistically significant relationship must be demonstrated, and the role of confounding factors must be eliminated.

For several reasons, such a degree of proof will be difficult, or virtually impossible, to provide. And this approach is particularly unrealistic for evaluating the effects of low-level, multiple chemical exposure. It is difficult to measure the exposures and the effects, which are often subtle and take decades to show up, in some cases, even up to 30 years. There are also other factors such as the lack of uncontaminated population for comparisons, the effects of multiple contaminants and other influences, and of course the limitations imposed by the tools currently available to scientists, specially to toxicologists and epidemiologists.

On the other hand, the basic principle of public health practice is disease prevention. Requiring that cause-and-effect relationships be proven before taking action violates this principle. There is no scientific or ethical reason to presume that chemicals are harmless until they are proven otherwise. Such an approach allows action only after irreversible harm has been caused to human health and the environment.

We therefore need a new standard of proof – the "precautionary principle" which puts safety first and not the proof or 'evidence beyond a doubt'. The precautionary principle must be the framework for evaluating available scientific information and for making policy decisions concerning the production and use of chemicals as well as other practices that may affect health and the environment. Because we cannot predict the precise impacts of chemicals on the environment and on human health, the precautionary principle requires that we err on the side of caution. We cannot wait till strict proof is available because by then irreversible harm can be caused.

Many national governments have already agreed to the precautionary principle in various international fora, and it has been established in a number of international agreements. However, although the validity of the principle is widely accepted, it has not yet been implemented in many cases: most government and industrial policies and regulations continue to be based on the old reactive approach. It is time governments implemented the precautionary principle to which they have already committed.

The precautionary principle seeks to prevent harm before it happens. It requires that chemicals that may cause harm should not be released into the environment.

In the case of organochlorines, for instance, the available evidence already indicates that these chemicals may –and do—cause harm to health and the environment. There is extensive evidence that organochlorines tend to be persistent, ubiquitous and toxic. Therefore, action to prevent further contamination of the environment by these chemicals is overdue.

Source: "Chlorine, Human Health and the Environment: The Breast Cancer Warning", A Greenpeace Report by Joe Thornton, 1993.

binding instrument to phase out persistent organic pollutants (POPs) which initially includes 3 chemicals and nine pesticides (PCB's, dioxins and furans, aldrin, dieldrin, DDT, endrin, chlordane, hexachlorobenxene, mirex, taxaphene and heptachlor). ***(See Article 'Persistent Organic Pollutants in Asia' on page 71).***

The proposed convention to ban certain persistent organic pollutants or POPs provides a unique opportunity to achieve global bans on certain pesticides. Due to their endocrine disrupting effects and suppression of the immune system, POPs have an impact on health and wildlife at very low levels. They are a concern because they easily accumulate in the environment to levels that cause adverse impacts. Negotiations on a POPs convention, including nine pesticides, have begun. But aside from DDT, the other pesticides proposed for a ban are little used. To have a real impact, the convention needs to address pesticides such as endosulfan (a known endocrine disruptor) which are more prevalent. The criteria being discussed for use in identifying additional POPs for global phase out are therefore an essential factor in the negotiations. Ironically, many of the substitutes for POPs are either known to be, or may turn out to be, endocrine disrupting chemicals.

Policy on Endocrine Disruptors

In order to significantly reduce exposure to EDCs, we need to focus on reducing exposure to endocrine disrupting pesticides and chemicals, and to stop their use. We need to look for safer non-chemical alternatives.

In households, it is believed only the least toxic pesticides are used but even these may contain EDCs. For example, cypermethrin and some of the other pyrethroid class of pesticides have been implicated as being EDCs. In light of the particular harm that EDCs can cause young children, these endocrine disrupting pesticides are a serious concern. Household pesticides are sprayed indiscrimi-

nately, and the use of mosquito coils for example, exposes children for almost eight hours daily.

Governments need to review, evaluate and screen chemicals for both their acute and chronic toxicity, in reaktion to the conditions of use in their countries. Chemicals need to be screened for their reproductive and endocrine-disruptive effects with bans and severe restrictions being imposed on these chemicals. But the reality is we will never be able to catch up with all the screening that has to be undertaken. The new studies point towards the need to adopt the precautionary principle, when dealing with pesticides where toxicological hazards have been established and the risks not fully understood. Or where there are toxicological gaps in knowledge either on the precise effects of the pesticides or on the mechanisms for toxicity. ***(See Box 'Proof or Precaution: When Do We Act?)***

More often than not the regulatory agencies responsible for crop protection and pesticides regulations are the Ministries of Agriculture whose concern is also productivity and food security. In many cases, productivity concerns often outweigh concerns for health and environment. The development of a set of policies that serves the public's interest needs to be the responsibility of a neutral agency whose first priority is to protect human health and the environment, and in addition allows for public participation in policy dialogue. With such public involvement, such transparency should curtail the influence of vested interests. The so-called 'revolving door' between persons in government regulatory agencies and the industry they are regulating and vice versa would become more apparent and open to question. In the U.S., it has been documented that some government officials in regulatory agencies leave the agency for more lucrative jobs in the very industry they were regulating, and vice versa.

Even when some governments undertake extensive evaluation and decide to restrict pesticides, companies have challenged them in court to overturn the decisions. The Hoechst action against the decision of the Philippine Government's regulatory authority, the Fertilizer and Pesticide Authority (FPA), in 1993 is a case in point. The FPA, after a review process, decided to restrict the pesticide endosulfan produced by Hoechst (trade name: Thiodan). Hoechst challenged the decision and the Makati Regional Trial Court Judge presiding over the case ordered the FPA to lift its restrictions on the sale and use of the Hoechst product. After the newspapers published a report revealing a conflict of interest between the Makati Regional Trial Court Judge and the Hoechst lawyers, the case was moved to the Supreme Court. When the issue reached the Supreme Court, it ordered the suspension of the proceedings of the Hoechst case. The company even sued public interest critics of their product. However, in the end the Hoechst lawyers never turned up for the hearings.

No Such Thing as 'Safe Use'

Training at improving health and safety awareness, although important by itself, is not sufficient. The reality of pesticide usage in Asia makes the "Safe Use" training promoted by the pesticide industry a nonsense and clearly reflects Northern working conditions. Poor farmers are often unable to read labels or afford protective clothing. They often use and apply use pesticides with bare hands, and expose their families and themselves to unacceptable levels of pesticides. In such conditions, pesticides that cause acute toxicity should not be allowed for use—especially those pesticides on WHO Class 1 list.

The reality of life and conditions in rural Asia suggests that only a concerted effort for pesticide reduction, and reduction on pesticide dependency will provide the long-term solutions. This coupled with international bans on pesticides known to be hazardous, may provide the best solutions to remove the source of hazards from farmers. A comprehensive policy to reduce pesticide use is needed, with clear proposals to help farmers move towards sustainable agriculture or organic agriculture which promotes the use of alternative pest control. Industry will also need to take a hard look at corporate policies that pressure sales staff to maximise profits with increased pesticides sales. There is a major contradiction when those in industry say they are 'promoting IPM or sustainable agriculture', but staff are working on commission wages i.e. "the more you sell the more you earn". These kind of financial implications require serious reassesment.

National Pesticide Use Reduction Plans and Integrated Pest Management (IPM)

Concerned about the health and environmental risks of pesticides, a number of countries have pursued a strategy of pesticide use reduction with specific targets for reductions and support for alternatives. Such policies have been instituted in Sweden, Denmark, South Korea, the Netherlands, Britain, USA, Canada and Switzerland.

Comprehensive government action plans to reduce pesticide use have been developed in several countries. In Sweden, a 47 per cent reduction was achieved by the end of 1990—the end of the first phase. By the end of 1995 it fell to 71 per cent, close to the original target of 75 per cent reduction. The Dutch programme aims to reduce

the volume of pesticides used by 50 per cent by the year 2000 and to reduce emissions to air, to soil and ground water (75 per cent by 2000) and surface water (90 per cent by 2000). As with other programmes, a strict re-registration scheduled has been imposed to remove the more hazardous pesticides from the market. Additional regulations were brought in to require licensing for those who store, use or sell pesticides. Subsidies were provided for research, extension and conversion to organic farming. By 1994 a 45 per cent decrease in volume had been achieved, largely through a drop in the use of soil sterilants and a shift to herbicides of lower volume, slower progress was achieved for reducing emissions. Denmark is pursuing an important and far-reaching policy question, addressing the issue of the potential for the country's agricultural production to become fully organic. At this time, it may be too early for a radical change, but the prospect does raise the question of what would be required at the national and local levels to make this a possibility in a practical way.

In terms of EDCs, Denmark, Finland, Norway, Sweden and Switzerland have taken on specific regulatory action against these chemicals for the simple reason that they have endocrine disrupting abilities as reported in a recent OECD survey on EDCs.[2]

In addition, the Integrated Pest Management (IPM) approach in rice cultivation in nine countries in Asia indicate a reduction in pesticide use by those farmers trained in IPM, with no drop in yields. It demonstrates the success of this approach not only in pest control but also in economic profitability (savings in expenditure on pesticides).

But the Problem Continues...

In spite of all the above strategies, the use of pesticides in agricultural production systems has continued to grow even with greater awareness of the health and environmental hazards of pesticides use and the demonstrated success of IPM programmes in Asia and elsewhere. Paradoxically, the implicit acceptance of these risks has not brought about lower levels of production risk for farmers. For example, despite a 33-fold increase in insecticide use in Japan between 1950 and 1974, average rice yields did not rise.[3] Reported losses to pests and diseases in North America are now higher than they were thirty years ago despite greater reliance on pesticides. According to Pincus, Waibel and Jungbluth in their paper, Pesticide Policy: An international Perspective[4], these above observations indicate that the social costs of pesticides exceed the benefits accrued to society from their use. They add, *"Pesticide use is characterised by large and measurable externalities in the form of health and enviromental risks, destruction of predator populations and pest resurgence and resistence to pesticides. These externalities impose costs on society in the form of illness, increased expenditure on health care, environmental degradation and clean up costs, and increased expenditures on crop protection."* They recommend a mechanism consisting of complete information, intelligent and impartial application of welfare economics to crop protection policy and open, transparent mechanisms for public participation in the decision-making process.

The inefficient and unnecessary use of pesticides is clearly shown in the case of Pakistan. According to recent reports, the use of pesticides has increased tremendously in Pakistan from 665 tons in 1983 to 44, 872 tons in 1998, resulting in a 53 per cent increase in pesticides use in cotton production. The increased use has induced pest resistence to pesticides and caused an outbreak of the cotton leaf curl virus in the 1990s in Pakistan. According to the Pakistan Agricultural Research Council, which has initiated IPM programmes in cotton to reduce pesticides use and pest resistance to pesticides, annually up to 10,000 farmers are poisoned by pesticides. ***(See Article 'The Pesticide Legacy in Pakistan: Time for a Change' on page 76).***

The experiences of countries with national pesticide use reduction plans and countries that have extensive IPM programmes indicate that pesticide reduction does not reduce farm productivity and in some cases there are increases in actual income. Economic viability and ecological soundness of agriculture requires a combination of national pesticide reduction plans with a farmer first IPM programme that would create the opportunities for moving into more sustainable agriculture.

Citizens Action and Advocacy

Citizens groups have been catalytic in raising awareness of pesticide hazards, advocating the need for safer food and agricultural production, publicising existing sustainable production systems as well as creating innovative sustainable agriculture programmes. They have also been known to contribute to the development of participatory approaches to training of farmers and awareness building. Fundamental to their struggle is the Right of Communities to Know, to be Informed, to Choose and the Freedom to Act to safeguard the health and environment of their communities.

The strategies for action have been so varied. Tenaganita (Women's Force) in Malaysia, PAN Philippines, UBINIG (Policy Research for Development Alternatives) in Bangladesh, and Community Edu-

cation Centre (CEC) in Sri Lanka have been working towards empowering farmers and workers (particularly women) to monitor the health hazards of pesticides, and to address and campaign against hazardous pesticides as well as to reduce women's exposure to these hazards. People's organisations such as KMP and AMIHAN (both federations of Peasant Movements) in the Philippines, Tamilnadu Women's Forum and the Assembly of the Poor of Thailand, have been empowering farmers, and to organizing people on their rights to land, livelihoods and justice. Other groups have continued to struggle to reduce the use of pesticides in food production and safeguard consumers including the Citizen's Alliance for Consumer Protection in Korea (CACPK), and ERA Consumer in Malaysia. In the pages that follow, citizens campaigns against EDCs are outlined, and provides examples of the struggle against pesticide and chemicals that are dangerous to human health, and may possibly impact the survival of the human race.

Participants of the PAN AP coordinated Alternative Pest Management Project at the Workshop in Thailand, 1998.

Publicizing existing alternatives systems of sustainable agriculture is another advocacy role that citizens groups have played. Citizens groups have also been at the forefront of building on existing local systems of food prodction as well as creating new and innovative systems of sustianable agriculture. Some of the innovation has brought together a unique partnership of between farmers, consumers and local communities. Consumers and local communities support and sustain farmers while farmers have responded to the needs of the local communities in providing safe and nutritious food. ***(See Article 'What s Sustainable Agriculture in Section Three).*** Such Community-Supported Ag-, riculture (CSA) has become popular in the U.S., Europe and Japan and countries in the South such as India, Malaysia, Philippines and Sri Lanka. Consumers and farmers have evolved a system where they meet directly and discuss their respective needs - consumers their requirements and farmers the price. Cropping patterns and prices are worked out as a consequence of this interaction. The U.S. now has over 400 CSA projects and some of them include over 200 families. The Teikei system in Japan works similarly. And variations exist in other countries.

Foods free from chemical hazards such as endocrine disruptors would only be possible if a more holistic and sustainable food production is supported and promoted. At the heart of such a system is the invaluable labour, skills and knowledge of local farmers that need to be recognized and valued. We need to learn from, and build on traditional alternative farming with the tools and technology that sustainable agriculture farmers have utilized. This learning, innovating and building is an integral aspect in creating appropriate and sustainable forms of agriculture.

For farmers in the South it is not just a question of sustainable agriculture but sustainable livelihoods and an agriculture that has to be both economically viable and ecologically sound. Farmers in Asia need decent and adequate livelihoods, and a price policy based on paying good prices to producers is vital for better living sirtuations for rural people. Land tenure and rights over land are crucial issues for farmers in adopting long term plans and to invest in long-term sustainable farming. Rural credit, infrastructure and services that reach the rural areas are important. Recognition of women's vital role and contribution in agriculture, and their empowerment are also crucial issues. These are the challenges for the long-term sustainability of agriculture and the challenge for a safer environment, and safer food for us all.

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Persistent Organic Pollutants in Asia

Based on existing and evolving evidence, Greenpeace (and other environmental organizations like PAN-ed.), as well as environmentally conscious citizens and citizen groups worldwide are pursuing the elimination of one class of chemical compounds called Persistent Organic Pollutants (POPs). POP chemicals, for reasons explained below, are among the most dangerous of life-threatening substances created by humans. Therefore, all human-induced generation of these chemicals must be rapidly phased out.

All the well known and established POPs are chlorinated compounds. These include: pesticides such as DDT, Hexa Chloro Cyclohexanes (HCH)[1], Aldrin, Dieldrin, Endrin, Chlordane, Heptachlor, Mirex and Toxaphene; industrial chemicals such as Poly Chlorinated Biphenyls (PCBs); and unwanted industrial by-products dioxins and furans.

While Western governments have already graduated from the stage of ignorance of the problem, to denial and, now, acknowledgement and action, policy makers and citizens in the developing world remains unaware of what these chemicals are and what they can do. Unfortunately, the producers of these chemicals have done little to warn their consumers. The fear of losing the last remaining markets for their products has significantly delayed the implementation of rapid phase-outs of POP chemicals and their sources.

Currently, very little information exists in a compiled form regarding the most pressing POP problems in Asian countries. This conveys a false sense of security to policy makers in Asia. POPs present a particularly significant problem in Asia, which is perhaps, the world's largest producer and consumer of many POPs chemicals.

POPs are known to have the potential to cause irreversible and debilitating damage on entire ecosystems and species populations, including humans. The threat is made even more significant by the fact that once released into the environment; these chemicals resist degradation by natural elements and persist in ecosystems and life forms for long durations of time.

The POPs generated by human activities have managed to contaminate even the remotest environments. Evidence of injury to some wildlife and human populations due to POPs leaves us with little doubt that unless immediate action is taken to eliminate all human-made POPs and their sources, the health of the human species and other lifeforms as a whole may be threatened.

"Both people and wildlife, everywhere in the world, carry body burdens of POPs at or near levels that can— and in some cases, clearly do - cause injury to human health and to entire ecosystems."[2] This means that the solution to global contamination lies in concerted international action to eliminate POPs from the planet. More than three decades of dedicated campaigning by environmental and community activists and groups has finally resulted in the setting up of international process under the United Nations Environment Program (UNEP). With the right guidance this process can pave the way for elimination of identified POPs chemicals and others that may be classified as POPs in the future.

The right guidance will to be provided by forward-thinking experts in the governmental private sector and by the broad spectrum of citizens' groups and environmental organizations that continue to gather under the International POPs Elimination Network (IPEN).

IPEN argues that, "The goal of a global POPs convention must not be defined as the "better management of risks associated with POPs." POPs rep-

resent more than just a "risk." Indeed, they are a current source of significant injury to the biosphere — to humans, to wildlife and to entire ecosystems around the world. Because POPs by their very nature are unmanageable substances, the better management of POPs and POPs releases is not an appropriate goal for a global POPs convention. Rather the goals of a global convention should be to eliminate all POPs and POPs sources.

Business As Usual ... in Asia

Chemicals now categorized as Persistent Organic Pollutants were blacklisted in all western nations at least a decade ago. In Asia, a combination of factors has resulted in the continued product trade, use and release into the environment of most of these chemicals.

The common thread in the hazardous POP situation in the eight Asian countries visited by Greenpeace is that in each country, citizens bear the environmental cost of POPs usage, manufacture or storage; citizens are likely to also bear the cost of its eventual disposal. Corporate accountability, extended producer responsibility and the principle of polluter pays is unheard of concepts in this region.

Some examples that demonstrate this:

A series of investigations by Greenpeace International in Pakistan, Nepal, India, Bangladesh, Thailand, Vietnam and the Philippines in 1998 revealed that:

- Manufacturing, trade and usage of many POPs chemicals; continues unabated.
- Obsolete POP pesticides are stored in more than 1000 stockpiles in Pakistan under highly hazardous conditions.
- Lack of awareness about handling PCBs in electrical equipment may create a dangerous situation during disposal. Even Thailand which understands the dangers of PCBs continues to store PCB containing equipment in unsound conditions.
- Hazardous activities of the past have left behind a legacy of poisons such as in South Vietnam where war-time spraying of Agent Orange by the U.S. armed force, has contaminated entire districts. In the Philippines, several sites in former U.S. military bases were found to be severely contaminated with toxic chemicals including PCBs, aldrin and other persistent organic pollutants.
- Asia is poised for a disturbing expansion of POPs - producing technologies sucj a incinerators, cement kilns retrofitted for hazardous waste burning, PVC manufactories, and pulp and paper mills.

- The obsolete pesticide stockpiles in Pakistan arid Nepal contain chemicals from well-known chemicals corporations such as Hoechst, Bayer, Shell, ICI, Velsicol, Dow, Rhone Poulene and DuPont. Barring one instance in Pakistan where Bayer has agreed to reclaim and destroy stocks of Gusathion, none of the multinationals have come forward to accept their share of the responsibility. Meanwhile, the official position of most of the multinational companies as articulated by the Global Crop Protection Federation is that "Obsolete stocks are principally a government issue. It is clear that the principal responsibility lies with the last owner/purchaser." [3]
- Intensive promotion of DDT as the *pesticide of choice* for mosquito and other vector control led to large "donations" of this chemical to South Asian countries. Nepal, in particular, received DDT for its malaria program from the 1950s from the USAID. The USAID program was discontinued in the 1980s, nearly a decade after the chemical was banned in the U.S. Currently, one storage site in Southern Nepal houses 16 drums of date-expired DDT dust. Its origins are unknown but shouldn't be too difficult to find provided past records of bulk imports of DDT exist.
- Recent environmental studies commissioned by the Philippine Government confirm that the former U.S. military bases in the Philippines are severely contaminated with persistent organic pollutants including PCBs, dieldrin, aldrin, chlordane, BHC and heptachlor. Newspaper articles in the local press report birth abnormalities and impaired intelligence among some children living near Clark. The U.S. Government has categorically refused to be held liable for the damage to human health and environment near its former bases in the Philippines.

The POP problem in Asia—between the historic problem of stockpiles of obsolete pesticides and the continued production of POP chemicals or proposed expansion of POPs-producing technologies—is too large, complicated and expensive for individual Asian nations to handle.

The international process initiated by the United Nations Environment Program (UNEP) presents a suitable forum for Asian countries to air their concerns and recommend solutions. Asian governments must participate actively in the UNEP process and to press for the adoption of the following principles during the ongoing POPs negotiations:

- **Polluter Pays and Corporate Responsibility:** This principle must be implemented beginning with the problem of historic contamination - stockpiles and hotspot areas. Application of this principle would, for instance, require the U.S. Government to pay for the clean up of the contaminated military bases in the Philippines.
- **Precautionary Principle**
- **Technological and other resource assistance** must be extended to developing country governments to phase out the remaining usage and generation of POPs, and in the identification and implementation of suitable non-chemical alternatives and systems.
- **Action Plan:** Any action on POPs must take into account the difficulty faced by developing country governments in implementing legislation. As a rule of thumb, a ban is more easily implementable than a restriction. Zero emission is easier to ensure than "regulated" emission.
- **Elimination of all POP sources:** If a substance is listed as a POP, all production and human-made sources of the substance should be eliminated in a rapid and systematic manner taking into account the specific requirements of developing countries.

In dealing with Persistent Organic Pollutants, Greenpeace advocates that:

- **For intentionally produced POP chemicals:** All production, usage and trade of intentionally produced POP chemicals are phased out in a rapid and orderly manner.
- **For POP chemicals such as dioxins and furans that are unintentionally produced during certain industrial activities or as a result of waste incineration:** The significant human-made sources of POP emissions should be identified and phased out.
- **For stockpiles of obsolete POP chemicals:** Immediate action should be taken to identify inventory and contain obsolete POP chemicals. A system to similarly contain POP stocks that become obsolete over the coming years should also be set up. Finally, the stocks should disposed in a manner that do not give rise to other POP chemicals or pose a hazard to the environment or life in any manner.

Greenpeace has concluded that to afford adequate protection of both local and distant population of humans and wildlife, the technologies, used for destroying stockpiles of persistent organic pollutants must meet the following fundamental performance criteria: [4]

1. ***Destruction efficiencies of effectively 100 percent for the chemicals of concern:*** *The determination of 100 percent destruction efficiency requires the absence of any detectable concentrations of chemicals of concern in any and all residues, using the most sensitive analytical techniques available worldwide. Analyses of the residues must be carried out sufficiently frequently to ensure compliance with this criterion during startups, shutdowns and routine operations.*

2. ***Complete containment of all residues*** *for screening and, if necessary, reprocessing to ensure that no residues contain detectable levels of chemicals of concern or other harmful constituents, such as newly formed persistent organic pollutants or other hazardous substances.*

3. ***No uncontrolled releases.***

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1. *Hexachlorocyclohexanes (HCH) are also referred to as BHC in South Asian countries. Technical grade HCH is an insecticide, which is comprised of a mixture of different isomeric forms of HCH. The approximate isomer content is alpha-HCH (53-70%); beta-HCH (3-14%); gamma-HCH (11-18%); delta-HCH (6-10%); others (3-10%). The insecticide Lindane is the common name for the gamma isomer. Another compound that is confused with BHC is Hexa Chlor Benzene (HCB). HCB has a variety of sources including its previous use as a fungicide for seed grain. It is produced as an unwanted by-product or impurity in the manufacture of chlorinated solvents, other chlorinated compounds such as vinyl chloride, and several pesticides. It is also produced as a by product in waste streams of chloralkali plants and wood preserving plants, and in fly ash and flue gas effluents from municipal waste incinerators. Its main source in the environment today is from the manufacture of pesticides.*

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Pests, Pesticides and Suicides: Need for a New Vision

by Devinder Sharma

Introduction

Crop failure resulting from the resurgence of a dreaded crop pest is certainly no provocation for an extreme step like committing suicide. Yet over 500 farmers in various states in India (Andhra Pradesh, Maharashtra, Karnataka, Punjab and Haryana) had killed themselves in the past two years following crop failures, to escape the humiliation from indebtedness.

These were cotton farmers, chasing the 'benefits' promised by the increasing commercialization of India's farming. And all indicators point to the possibility of recurrence of these suicides given a favourable environment for the cotton pests to proliferate. And behind the mounting death toll hangs a sordid tale.

Much of the crisis afflicting cotton is the result of the indiscriminate use and abuse of pesticides. But let us first understand what makes farmers make excessive use of pesticides on cotton. What essentially began as a quest to control the spread of the American bollworm, which feeds on the crop, often resulting in a total loss, has turned out to be an unsavoury battle between the chemical pesticides industry and the pest.

The Pesticide Treadmill

For the pesticides industry, the American bollworm is a blessing in disguise. It has over the years sustained the profit margins of the pesticides manufacturers and traders irrespective of the extent of crop damage.

As a result, cotton alone consumes nearly 55 to 60 per cent of the total quantum of pesticides sprayed in India. The insect devours crops worth an estimated 25,000 million rupees (Rs.) a year (1 US$ is approximately Rs. 43.5). From one crop to another, and from one cropping season to another, it attacks more than 90 different kinds of crops. And its spread is such that the polyphagus American bollworm is presently a menace in 62 countries.

Despite a long history of pest control, the insect thrives happily, and 'resists' a volume of as many as 15 to 20 sprays, and, in some extreme case, even 35 sprays. While agricultural officials have begun to chant the mantra of multiplying insect-resistance, the trade gets ready with still more potent chemicals. Such is the deep-rooted nexus between trade and the plant protection officials in the State Agriculture Departments.

It was in 1983-84 that the Punjab Agricultural University of Ludhiana (India) approved the fourth generation pesticide, synthetic pyrethroids, for use on cotton. The same year a neighbouring university, the Haryana Agricultural University at Hissar, objected to the use of pyrethroids on the plea that the chemical was harmful to wildlife and possibly also a carcinogen. The next year, in a complete turnaround, the Hissar university also recommended the application of synthetic pyrethroids. And thus began a 'circle of poison'.

Within a couple of years, the insect had developed varying degrees of resistance to the pesticides. Scientists had even suggested banning the use of pyrethroids in certain parts of the Cotton Belt. Instead, the farmers began increasing the dosage of the chemical to maximize crop yields. And when even this began to be ineffective, farmers started tank-mixing of synthetic pyrethroids and organophosphates. Taking a cue, the pesticide trade has launched several ready mixtures of insecticides.

Of Pest Resistance and Resurgence

Almost 15 years after the synthetic pyrethroids were recommended in Punjab, the Punjab Agri-

cultural University is now urging the State government and the Indian Council of Agricultural Research (ICAR) to impose a moratorium on the use of the chemical. Hailed earlier as the 'saviour' of the farming community, it has now turned into an 'economic burden'. Farmers in Punjab had sprayed Rs. 3,800 million worth of pesticides on cotton in 1988 and in return had earned only Rs. 2,500 million from seed cotton.

Added to this is the growing menace of fake pesticides. More often than not, the pesticides cocktail is spurious. In Andhra Pradesh's Warangal district, for instance, a series of raids have unearthed how serious the problem with fake pesticides is. Almost the entire quantity of pesticides being sprayed has been found to be bogus. In Punjab and Haryana too, the menace of fake pesticides is too serious to be overlooked.

The spate of suicides that caught the nation's attention in 1987-88 was the result of the American bollworm developing resistance to synthetic pyrethroids. Ten years later, the insect once again appeared in a devastating form. And in these years, cotton farmers in Warangal district began spraying more than Rs. 2000 million worth of pesticides every year. But before the American bollworm emerged on the crop, a hitherto secondary insect pest of cotton—spodoptera—had caused extensive damage to the cotton foliage. The American bollworm did the rest. Caught in the vicious circle of poison, and the resulting indebtedness (having borrowed heavily to buy the resources needed, including land rent, seeds, pesticides, etc), farmers in Warnagal district were left with no choice.

And yet, the villain of the story is not the American bollworm. There are 28 known natural enemies of bollworms in the cotton field. Nature has provided enough protection for cotton through the abundance of benign insects available in the field. But the tragedy is that it is the benign insects that first get killed when the pesticides sprays are applied. Bereft of its natural enemies, the American bollworm appears stronger in the crop fields. And when the pesticides begin to disturb nature's equilibrium, many of the little known pests of cotton, like the white fly, too emerge as major pests.

Gene Tech Fixes or Visionary Solutions?

Once again, agricultural scientists are looking for still more potent chemicals to replace synthetic pyrethroids. Not learning any lesson from the cotton debacle in the past, scientists are even suggesting the adoption of genetically engineered cotton varieties knowing well that the insect will develop resistance to the gene for resistance in the years to come. If it was the failure of the synthetic pyrethroids that forced the farmers to commit suicide in the 1980s and 1990s, it will be the genetically engineered cotton, which will turn into a farmer's scourge in the 21st century.

Must the nation therefore continue to follow the ill advice of the agricultural scientists who are often in league with the chemical (and now the biotechnological) industry? Why can't the ICAR (Indian Council of Agricultural Research) look for natural control measures that avoid the use of chemicals and the option of genetically modified crops? All it needs is a proper vision and approach for the agricultural scientists to come to the rescue of the farming community. For once, agricultural scientists must demonstrate their resolve to bail out the cotton farmers from the "circle of poison".

The question is: will they?

Source: "The Hindu Business Line", India, August 24, 1999. The author, Devinder Sharma, is a well-known food and trade policy analyst, and Coordinator of the Forum on Biotechnology and Food Security based in New Delhi, India. For further information or queries contact Email: dsharma@isid.delhi.nic.in

The Pesticide Legacy in Pakistan: Time for a Change!

by Nasira Habib

While many countries in the world are abandoning chemical pesticides, their use is increasing in Pakistan. According to a report by Rauf Klasra published in the daily Dawn, the country registered a sharp increase during the last decade. He recorded a usage of 44,872 tons in 1998, a sum that was 53 times more than the 665 tons used in 1983.

Privatization of the pesticides business became the major vehicle for the aggressive promotion of the poisons. In 1981, when the process of privatization started, only 4 per cent of the cropped area was covered by synthetic chemical plant protection but in a span of only 10 years it spread to over more than 25 per cent of the cropped area.

Lethal Practices

It is not only the volume of pesticides used but also the greed to maximize the profits that has led the pesticide business to forget the safety standards professed by the industry themselves, and compounded the problem even further. Workers spraying pesticides bare bodied, bare foot, without covering their nose and mouth, is not an uncommon sight. Women cotton and vegetable pickers who commonly work in heavily sprayed fields along with their children, and during pregnancy, are dangerously exposed to the chemicals.

A recent study by Pakistan Agricultural Research Council reported more than 10,000 poisonings every year in the cotton-belt. The figure seems to be conservative in the absence of documentation of the rate or kind of incidence of pesticide poisoning. The figures for chronic poisonings can run into millions the way the poisons are used.

The vulnerability of women farmers comes from the findings of the following studies. A study at Multan has shown that out of a total of 88 female cotton pickers only 1 per cent could be termed as "out of danger", while out of 33 male cotton workers 12 per cent could be ranked "out of danger". Another study found the situation of the cotton workers at Central Cotton Research Institute, Multan (where conditions must be much better than the actual field conditions) slightly better, where 28 per cent male and female workers were considered "out of danger". Here again, 57 per cent of the women workers had their blood acetylcholine esterase (AchE) inhibited to between 50-87 per cent, that is being seriously exposed.

Poisoned Food

During the past decade research has indicated the presence of pesticide residues in a number of food items. In some cases the residues were present beyond the World Health Organization (WHO) permissible limits. A study, done under the auspices of the Federal Pesticide Laboratory, on 59 fruits and vegetables procured from wholesale markets of Karachi during July 1988 to June 1990 revealed that out of the 250 samples screened, 93 samples were contaminated with a variety of pesticides. Forty five samples were found to contain residues above the maximum residue limits.

Earlier studies conducted at the University of Agriculture, Faisalabad during 1981-84 have shown 35 per cent market samples of cucumber with residues of Endrin. Similarly 42 per cent of the okra sampled had Endrine residues. The presence of Endrin in market samples indicated that even after the ban on the use of Endrin, it was somehow reaching the farmers.

Scientists at the Nuclear Institute for Agriculture and Biology, Faislabad conducted research with radio labelled insecticides focusing on their accumulation in animals. The findings showed that

50 per cent of the monocrotophos fed to lactating goats was excreted in urine, and 7 per cent in faeces. Two per cent was found in milk and the rest retained by various body organs and muscles.

Of Food Security and Safe Food

Chemical pesticides are playing havoc with the health of people. The poisons were introduced with a promise of securing sufficient food for the increasing population. Paying a high price in the form of unsafe and unhealthy food could not guarantee self-sufficiency in food. The agricultural sector registered a marginal growth of 0.35 per cent in 1998-99, resulting in a large food import bill.

As regards cotton, more than 70 per cent consumption of the total use of pesticides in the country could not have a check on the fluctuating fortunes of farmers. No amount of pesticides could stop the sharp decline in cotton production last year that fell to 7.76 million bales as compared to 12 million bales in 1987-88.

Not only has the promise of more food for increasing number of mouths to eat not be fulfilled. Additionally, agricultural land has been degraded, soil fertility has decreased, immunity has developed among pests and new pests took birth, the environment was polluted, crop friendly organisms have been destroyed, and surface and ground water contaminated. Such a scenario makes the prospects of future food production discouraging.

The policy on the use of chemical pesticides is in favour of promoting the use of pesticides, giving marginal recognition to the significance of integrated pest management. There are some programmes undertaken by the government but they do not have the out reach to the farmers. Instead they are caught by scientific research syndrome. First they need to laboratory tests, then green house tests and then field tests. It is only after these tests that the new technology can be launched to farmers in the fields. One wonders whether we are left with that kind of time.

The Soil Sciences Department of the University of Agriculture and Nature Farming Research and Development Foundation seems to be the only exception that is actively promoting technologies for nature friendly agriculture.

Many measures can be taken to respond to the menacing problem but the presence of strong political will is the most important prerequisite. Equally important, more and more action to organize women and men farmers around their most basic right of life, that demands access to safe and healthy food, is the need of the hour.

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Source: Article based on Rauf Klasra's report that appeared in Dawn Economic & Business Review June 16-20, 1999.

The Korean Campaign on Endocrine Disruptors

by Kim Jai Ok

On June 25, 1998, the Citizen's Alliance for Consumer Protection (CACPK) launched the Campaign on Endocrine Disruptors with a seminar. It was the first Seminar of its kind in Korea, with the participation of the Korean Minister of the Environment, Dr. Micheal Smolen of the World Wildlife Fund (WWF) of the U.S., as well as Korean scientists, high-ranking Korean government official's, NGOs and members of the media.

CACPK also held a press conference, the result of which the media carried extensive news on Endocrine Disruptors —pesticides and chemicals— and its ability to reduce fertility and sperm counts. Information in the form of a poster was distributed to the press, farmers, NGOs and Government officials. Consequently, the effects of Endocrine Disruptors (EDCs) were given much publicity in the newspapers, and by some of the NGOs present. This drew the desired attention, since anyone who had read or heard about it wanted to know more. In terms of responses from the Government, the Minister of the Environment felt the need to take immediate action on the issue.

After the CACPK Seminar, the Korean National Assembly Standing Committee held a public hearing to discuss EDC problems and the need for a 'Counterplan'. By August 1998, the Ministries of Environment, Health and Welfare, and Industry and Trade formed a 'Counterplan' committee. CACPK was invited to join the committee.

CACPK's EDC Campaign was organised in three steps:

- Lobbying of the government
- Participation of NGOs, by helping to create awareness
- Testing and research

CACPK then undertook testing of selected items such as powder baby milk bottles made of polycarbonates, where residues of Biphenol A (a known endocrine disruptor) were found. Prior to this, Kangwon University undertook tests on a popular brand of instant noodles packaged in cups made from polystyrene, and found styrene dimers and styrene trimers.

CACPK also undertook tests on 20 types of vegetables for pesticides, which were known endocrine disruptors. Residues were found in the tested vegetables, some of the results are included in Table 1. Plans for 1999 include:

1. Laboratory testing of all plastic bottles, for the next two years.
2. Research on consumer's attitudes and knowledge about Endocrine Disruptors.
3. Campaign Issues include:
   - Promoting organic farming and its products

Table 1 – Sample Results of Pesticide Residues Tests on Selected Vegetables

Name of Pesticide	Vegetable Tested	Level of Pesticide Residue	Standard (ppm)
Chlorpyrifos	Sesame Leaf	0.211	0.01
Endosulfan	Spinach	1.634	1.0
	Chinese Cabbage	0.303	2.0
	Cucumber	0.046	0.5
	Stone Leek	0.695	1.0

- Encouraging breast feeding
- Avoiding plastic materials suspected of containing EDC chemicals
- Minimizing waste
- Avoiding use of plastics bowls or containers in microwave ovens
- Getting more people to join the Endocrine Disruptors campaign!

In terms of efforts to press the government to build EDC testing systems, CACPK also publicized the results of tests on dioxin done on fast foods in the U.S. In March 1999 CACPK publicized the results from tests conducted by the Health Science Center at the State University of New York. A team at the University tested 4 fast food items—Kentucky Fried Chicken, MacDonald's Big Mac Ham Burger, Hagen Daz Chocolate Chip Ice Cream, and Pizza Hut's personal pan pizza supreme—and found them contaminated with dioxin. CACPK subsequently called on the Korean Food and Drug Administration (FDA) to test these fast foods, as well as other foods and food containers.

In June 1999, after dioxin was found in Belgian pork, public awareness seminars on dioxins, and demonstrations, all designed to draw attention and create awareness, were organised. CACPK worked with the Korean environment federation and women's organizations on this issue. Some collaborative efforts have included visits to the Ministries of Agriculture and so forth, and demonstrations in front of government buildings, and in central Seoul City.

CACPK also publicized test results from an earlier study showing that dioxin and other harmful chemicals were also found in food products from the U.S., the world's largest meat exporter. These were results from tests conducted by a research team led by Professor Armond Schecter of the State University of New York – where 12 food samples collected from supermarkets across the U.S. in 1995 were screened for dioxin. As such, concerned people and mass media are kept informed.

CACPK lobbied the Ministry of Agriculture to test imported products, especially from the EEC, Belgium and the U.S.A. for the presence of dioxin, and other harmful chemicals. The Korean government was also pressed to speed up reform of the nation's complicated imported food distribution system to help consumers, as well as to set up the necessary food safety checks. Additionally, the Korean government and the government of Japan have been working hand-in-hand, by organising exchange programmes.

Additionally, in August 1999 CACPK organized a research team and initiated a study on consumer awareness and attitude to EDCs, which is expected to be completed in March 2000.

A major consequence of all of these activities is that the Ministries of Environment, Agriculture, Industry and Finance, set aside some funds, referred to specifically as the Endocrine Disruptors Budget. Together with participating NGOs, and scientists, it has also drawn up a 10 year Plan to deal with the issue. The Plan is as follows:

- Stage One ⇒ 1999 – 2001 ⇒ Preparing , Testing and Research
- Stage Two ⇒ 2002 – 2004 ⇒ Development of evaluation plans of Endocrine Disruptors and also preparing a data base of safety levels
- Stage Three ⇒ 2005 – 2008 ⇒ Development of guidelines for production and promotion of EDC safe materials

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Source: The above article is based on the presentation by Kim Jai Ok to the Regional Workshop on Women and Pesticides, "Women Protecting Health and the Environment", organized by Pesticide Action Network (PAN) Asia and the Pacific, August 24-26, 1999.

For more information on the Korean EDC Campaign contact CACPK, KPO Box: 411 Seoul, 110 062 Korea. Tel: (82) 2 739 5441/739 5530/738 5555 Fax: (82)2-7365514; E-mail: cacpk@chollian.dacom.co.kr

Japan Offspring Fund Tackle Endocrine Disruptors

by Kaori Takise

The Japan Offspring Fund (JOF) is a consumer and environmental non-governmental organization established in 1984. It is devoted to research and education on matters involving the safety of daily life, including chemical residues in food and food-related diseases. JOF is supported by more than 4,000 subscribers to the monthly newsletter, Safety of Our Foods and Life.

JOF has researched into issues such as chemicals and pesticides, endocrine disruptors, and genetically engineered food that would have an impact on peoples' lives. The public awareness and outreach activities include publishing information on these issues via journals, post cards, and posters, and producing videos.

The JOF Safety List

One of the main activities JOF have undertaken to engender greater public awareness of endocrine disrupting chemicals and the dangers these present to present and future generations is to publish a set of information posters.

The set of four posters—the JOF Safety Checklist Series—highlight the various sources of EDCs, materials that may contain EDCs and and the human health impacts as well as implications to animals and the environment. The posters are as follows:

1. Plastics We Can Use and Plastics We Must Stop Using, Cut Off the Source of Dioxins. The poster stresses the following:

➢ Plastics containing chlorine release dioxins when incinerated. Also, some plastics release substances, which disrupt our natural hormone systems (endocrine disruptors) when buried as wastes. Plastics look the same even if they are chemically different as such we need to read product labels carefully, in order to know their constituent elements.

➢ Diagrams and Graphs cite the sources of dioxin, what plastics are safe to use, the Classifications of Plastics, and levels of Toxicity of Raw Materials and Additives

2. Endocrine Disruptors Threaten Our Offspring. This poster deals with the impacts and threats of endocrine disrupting chemicals on human health and wildlife:

➢ There are information lists and pictures of impacts on various wildlife, and impacts on domestic animals.

➢ Lists of human health impacts and sources of endocrine disrupting chemicals (EDCs).

➢ Specific attention is given to consumer materials used for children that pose a serious threat to our future: baby milk bottles, teething rings and baby toys are made of polyvinyl chloride (PVC), which contains carcinogenic EDCs. When selecting toys, select one made from polyethylene, and avoid too many plastic toys.

➢ Avoid using polystyrene coffee/tea cups (since these containers can also pose a health threat).

➢ Some pesticides, found as residues on our food, are also endocrine disruptors (the poster lists a few of the worse offenders).

➢ Some plants including soybeans contain estrogens. There is no problem with that. However it is not advisable to give soybean milk to infants.

This poster also stresses that when we are exposed to EDCs through the food chain, they mimic natural hormones and disrupt one of our body's most basic regular mechanisms. One of the best ways to avoid all these damages to our endocrine systems, is to eat genuine organic food whenever

possible!

3. Decreasing Sperm Counts: What We Can Do to Protect Our Offspring? This poster deals with the links between EDCs and increasing evidence of impacts on quantity and quality of sperm – something which could seriously impact the future of humankind. The poster advocates suggestions to protect ourselves from harmful EDCs:

- Avoid chemicals that harm our health!
- As much as possible, choose healthy foods when pregnant.
- Promote breast-feeding, otherwise the use glass baby milk bottles is strongly recommended.
- Eat organic food, and avoid agricultural products with chemicals.
- Avoid PVC food wrappers. Use polyethylene wrappers without chemical additives, and store food in glass or ceramic containers and not rubber products.

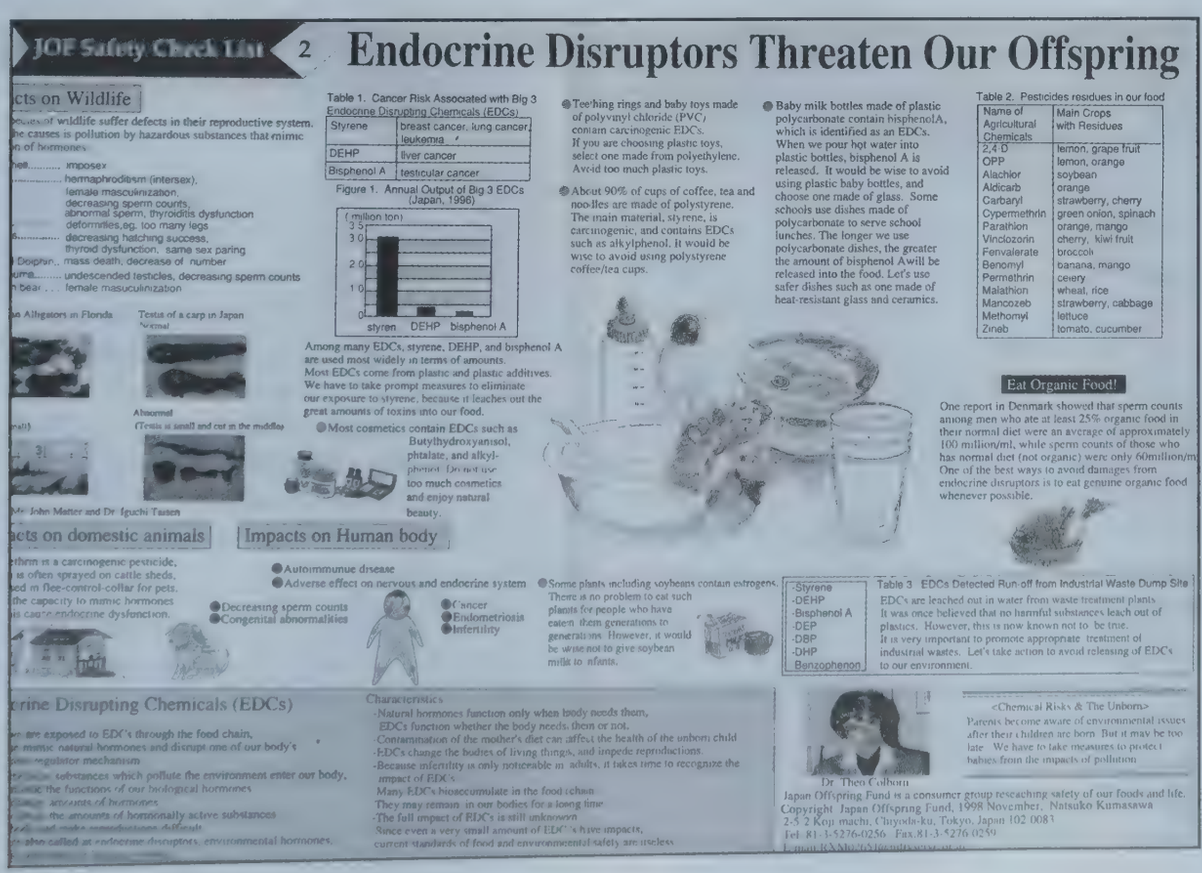
"Parents become aware of environmental issues after their children are born. But it may be too late. We have to take measures to protect babies from the impacts of pollution" states Dr Theo Colborn, on 'Chemical Risks and The Unborn', in a quote included in the poster.

4. Dangers of Cosmetics and Skin Care Products. This poster stresses the fact that more than 3,000 chemicals are used in cosmetics worldwide. Among these, more than 100 chemicals are known to cause allergenic responses for some people. Countries have regulatory systems that vary in terms of how stringent they are, so we need to pay attention to not only listed chemicals, but also those that may contain dangerous chemicals but are not listed. The poster points out:

- Most cosmetics and skin care products contain endocrine disrupting chemicals. As such, it is advisable not to use too much cosmetics, but rather enjoy natural beauty.
- No "natural" cosmetics are chemical-free. It is better to avoid products that are labelled ambiguously.
- "UV" cosmetics that do not indicate their SPF level do not protect the skin from UV rays. UV absorbers often irritate skin and some toxic substances can penetrate it and reach internal organs.
- "Medical" cosmetics, only prevent skin problems, and do not cure them. In much the same way, hair growers can not replace lost hair

The poster catalogues the problems with commonly used cosmetics, and also lists possible endocrine disruptors, surfactants that kill off fertilized ovum, the possible carcinogens, and possible allergens.

The above article is based on the presentation by Kaori Takise of the JOF to the Regional Workshop on Women and Pesticides, "Women Protecting Health and the Environment", organized by Pesticide Action Network (PAN) Asia and the Pacific, August 24-26, 1999.



Stopping Endocrine Disruptors in Malaysia

In April 1999, the Consumers Association of Penang (CAP), Malaysia announced the launch of its Campaign against hormone disrupting chemicals. During the launch, CAP called on the Malaysian government to undertake urgent measures on chemicals that are capable of disrupting the hormone or endocrine system of both humans and animals.

Citing increasing evidence of hormone related health ill effects and other serious implications of endocrine disrupting chemicals (EDCs) on human reproduction, CAP stated that there were studies from the North showing increased incidence of cancer and human reproductive abnormalities linked to these chemicals. Additionally, a number of Northern countries and international bodies have drawn attention to the problem and are adopting various safety measures to reduce the exposure to EDCs to humans and the environment.

A Sperm Crisis

CAP stated that, as early as 1985, it had addressed the problem of male sterility. In a memorandum to the Malaysian authorities, CAP had cited some studies conducted by the Malaysian National Family Planning Board, which showed that 30-40 per cent of all cases of infertility involved men.

According to the study half of the men studied suffered from a condition where the sperm count in the semen was far below normal. Five per cent of the men could be considered as having no sperm in their semen at all.

Available data from the Infertility Clinic of the National Population and Family Development Board showed that during the period 1986-1988, they performed semen analysis on 711 samples. Of these, 7 per cent of the samples tested were found to have no sperms whilst 20.5 per cent had sperm counts far below normal.

The Precautionary Approach

CAP stated that in Malaysia the incidence of infertility is certainly on the rise, "so much so that an expert has even described the situation as an infertility epidemic". Given the nature of the findings on EDCs in general, CAP has stressed that it is imperative for the Malaysian Government to adopt a precautionary approach. "This means that the Government adopt precautionary action to limit the use of potentially-dangerous chemicals and products, even where there is lack of full scientific certainty" states CAP in its newsletter, Utusan Konsumer, of April 1999.

CAP has urged the Malaysian Government to adopt the following:

- The Chemicals Act, which has been proposed by the Department of Environment for several years, must now be expedited. This is necessary in view of the fact that there is currently no comprehensive law to deal with industrial chemicals and consumer products other than food, pesticides, pharmaceuticals, drugs, cosmetics, and occupational health and safety. The new law must provide for protective measures against the adverse effects of EDCs;
- There should also be a review of existing legislation to ensure that Malaysians do not only take into account the cancer risk element but also the trans-generational health effects, the effects on hormones, as well as the immune and nervous systems;
- Establish an Interagency-Government Committee on Toxicity of Chemicals in Food, Con-

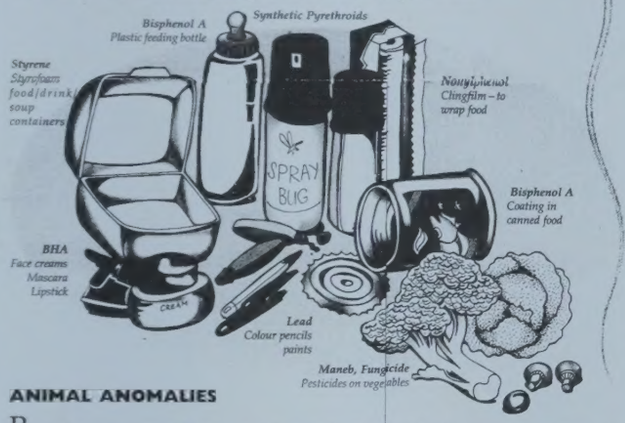
MORE MEN HAVE LESS SPERMS

SYNTHETIC CHEMICALS UNDERMINE MALE FERTILITY

A wide range of man-made chemicals may be threatening humankind's fertility and survival. These chemicals include:

- those used in plastics, insecticides, herbicides and fungicides;
- heavy metals like lead, mercury and cadmium
- industrial chemicals and pollutants like PCBs and dioxin; and
- substances which were considered safe in the past but are now banned, like DES (given to pregnant women to prevent miscarriages) or DDT (a once popularly used pesticide).

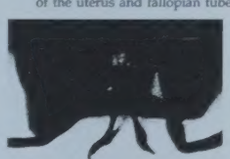
These endocrine-disrupting chemicals (EDCs) seem to interfere and mimic the action of hormones. Scientists have linked them to myriad effects, including low sperm counts, infertility, genital deformities, breast and prostate cancer, and hyperactivity and attention deficit disorder in children. In other words, these chemicals could be affecting our sexual behaviour, reproductive and immune systems. Perhaps the most far-reaching consequence is the effect that links endourine disrupters with reduction in sperm counts.



ANIMAL ANOMALIES

Research has shown the link between defects within the animal kingdom of various systems and the endocrine system. A series of wildlife abnormalities were discovered worldwide:

- **Alligators** with a range of reproductive problems, including underdeveloped penises.
- **Beluga whales** with an array of disorders such as malignant tumours; benign tumours, breast tumours; abdominal masses; ulcers of the mouth, esophagus, stomach and intestines; enlargement of thyroid glands; cysts; breast infections; twisted spines; males with uterus and ovaries; etc.
- **Panthers** with disturbing traits that included sterility, sperm abnormalities, low sperm counts, impaired immune responses and malfunctioning thyroid glands.
- **Seals** were found to have very high PCB levels, suppressed immune systems and deformities of the uterus and fallopian tubes.



The problem of animals with the organs of both sexes (hermaphrodites) is proliferating and cases of feminisation of rainbow trout and turtles with female egg-laying canals; and masculinisation of marine snails, mosquito fish, grizzly and black bears grow increasingly frequent. Most of the affected species were found to be - like humans - at the top of food chains, having consumed the accumulated and combined chemicals.

SPERM COUNTS DROPPED BY 50%

Dr. Niels Skakkaeback's study in Denmark on semen analysis examined data from over 15,000 men from 20 countries worldwide. The results were as follows:

YEAR	AVERAGE SPERM COUNT
1940	113 million per ml
1990	66 million per ml

The Scotland Medical Research Council Reproductive Biology Unit Study with a sampling of over 3,700 men shows:

YEAR	AVERAGE SPERM COUNT
1940	128 million per ml
1969	75 million per ml

SYNTHETIC HORMONE

When we are exposed to synthetic hormones through the food chain, they can mimic natural hormones and so disrupt one of our body's most basic regulator mechanisms. Such changes in our body will affect reproduction ability.

Contamination of the mother's diet can also affect the health of the unborn child.

Many synthetic hormones bioaccumulate in the food chain. This remains in our bodies for a long time.

Since even a very small amount of synthetic hormones has impact, current standards of food and environmental safety are useless. We are not protected by food laws and have to reconsider basic measures for our safety.

EAT ORGANIC FOOD!
One of the best ways to avoid damages from synthetic hormone mimic is to eat genuine organic food whenever possible.

Published by Consumers' Association of Penang (CAP)
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Tel: 604-229 3511 Fax: 604-229 8106

With the cooperation of Japan Offspring Fund and funded by Japan Fund for Global Environment
Printed by Jutaprint, Penang, Malaysia

sumer Products and Environment;

- Undertake extensive research and compile data on the hormonal effects of EDCs in the country.
- Consider the banning and phasing out of specific categories of EDCs such as pesticides, styrofoams, plastics and PCBs, and put in place suitable alertnatives; and
- Carry out education campaigns to educate the public on the dangers of EDCs.

Presently CAP is conducting the campaign against EDCs with the assistance of the Japan Offspring Fund ***(See Article: 'Japan Offspring Fund Tackle Endocrine Disruptors')*** to educate consumers on the dangers of EDCs. As an initial effort, CAP has prepared a poster on the issue, where the problem of declining sperm count among men has been highlighted.

Source: Utusan Konsumer, Volume 29 Number 4, April 1999.

For more information on the CAP Campaign on Endocrine Disruptors contact: Consumers Association of Penang (CAP), 228 Jalan Macalister, 10400 Penang, Malaysia. Tel: (604) 229 3511 Fax: (604) 229 8109

Notes:

Many pesticides can disrupt functions of your hormone (endocrine) system.

At very low doses, these Endocrine Disruptors can mimic, block or interfere with normal hormone activities in your body.

Adults can be affected but the worse impacts are on developing foetuses (unborn babies) and young children.

The greatest exposure to Endocrine Disruptors are from the Food we eat. Many chemicals used in industrial processes and production of consumer products are endocrine disruptors.

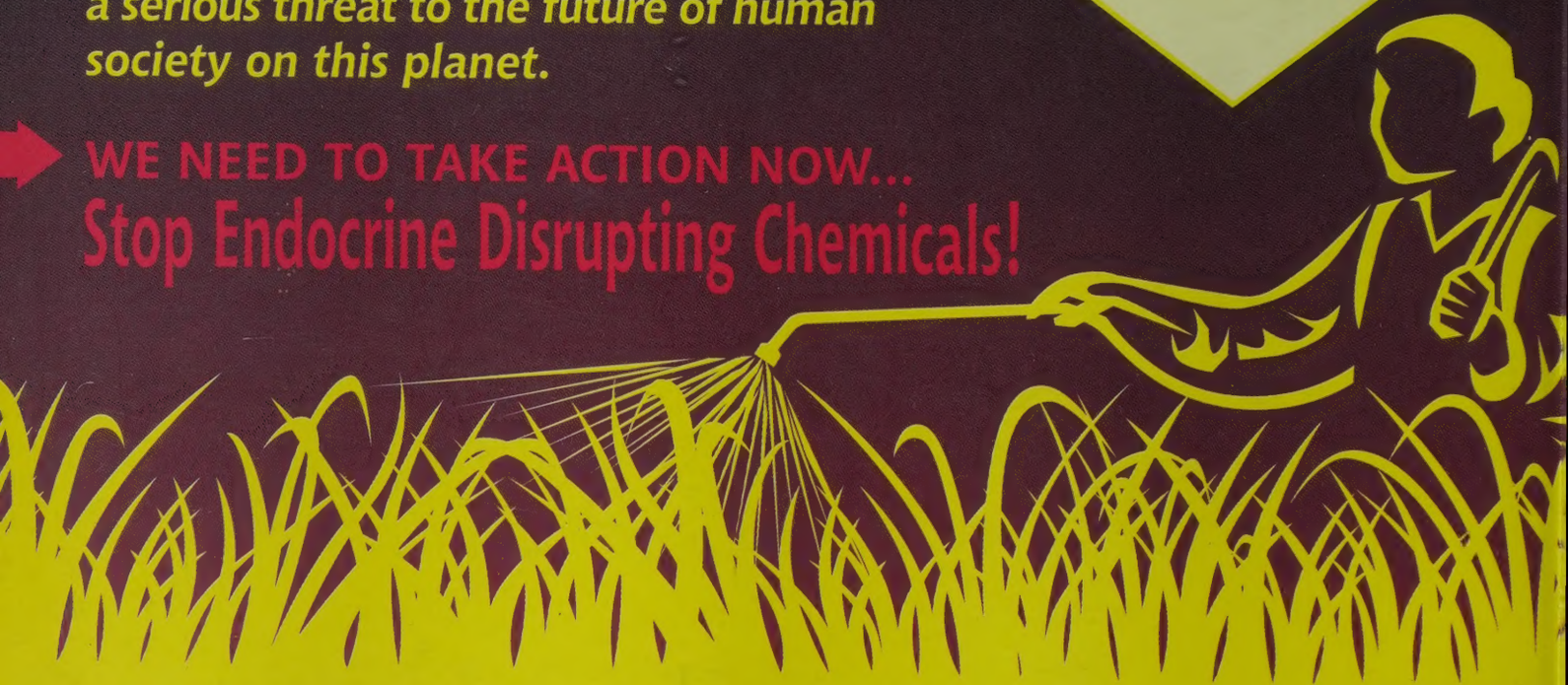
These chemicals are a danger to our health and the environment. More importantly, Endocrine Disruptors are a serious threat to the future of human society on this planet.

ENDOCRINE DISRUPTORS can contribute to:

- Breast, Vaginal, Prostate and Testicular Cancer
- Endometriosis (infertility disease and chronic pain)
- Decreased lactation (less breastmilk)
- Reduced fertility
- Reduced Sperm Count
- Malformed Penises (Hypospadias) and Shortened Penises
- Undescended Testicles
- Lowered IQ, Weak Immune systems, Learning Disabilities, Memory Problems, Behavioural Problems, and Early Puberty in Developing Children

WE NEED TO TAKE ACTION NOW...

Stop Endocrine Disrupting Chemicals!



The **PAN AP Safe Food Campaign for 1999** focuses on ***Endocrine Disrupters*** - exposing the threats man-made chemicals pose in disrupting the hormone systems of human beings and wildlife - with a particular emphasis on pesticides. The continued manufacture and use of endocrine disrupting chemicals, including pesticides commonly used in agriculture and food production, is a serious threat to the future and existence of the human family and biodiversity on the planet. The Campaign upholds peoples' right to know about the dangerous effects of endocrine disrupters, and to demand precautionary and protective measures towards a safer, more sustainable environment for present and future generations.

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